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# Forestry and Irrigation

H. M. SUTER, Editor

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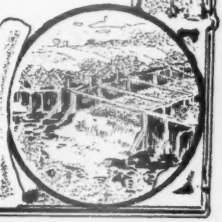

JOHN E. SHERIDAN

A Magnificent Forest and Mountain Scene. The Three Sisters, from Fish Lake, Cascade Forest Reserve, Oregon.
The timber is Alpine Fir and Bull Pine.


VOL. XII. JUNE, 1906. No. 6

# NEWS AND NOTES

**Senate Passes Reserve Bill**

On June 22, Senator Brandegee presented before the Senate the bill (S. 4953) for the purpose of acquiring lands for forest reserve purposes in the Southern Appalachian and the White Mountains of New Hampshire. The bill was passed without opposition. It authorizes the Secretary of Agriculture to procure lands for forest reserves in Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama and Tennessee in the Appalachian Mountains and in New Hampshire in the White Mountains. He is also authorized to accept donations of lands for forest reserves. The bill carries an appropriation of $3,000,000.

This action marks a further big step in the work being carried on to preserve our Eastern forests. All energy should now be directed toward the House of Representatives at the next session of the present Congress. Never has there been a better outlook for the passage of this bill.

**Membership Campaign**

For the past year the American Forestry Association has been engaged in an active campaign to increase its membership and influence. The success which has attended these efforts has been gratifying. A very substantial number of the persons invited to become members accepted, when the objects of the association were laid before them.

The association realizes that there never has been a time in the history of the forest movement in the United States when well-directed effort was so certain to achieve good results for forest protection as at present. Largely through it public opinion has been brought to bear on the agitation for the creation of the Southern Appalachian and White Mountain forest reserves, and it seems probable that Congress will take favorable action on the bill now before it. The success the organization has achieved in its varied efforts so far only emphasizes the desirability of extending its scope of operations and its influence throughout the country. This can only come through an increasing support in membership. The association desires and needs as members representative men and women in every city and town in the country. A very large proportion of persons in sympathy with the forest movement, or feeling

a patriotic interest in this great economic movement, would gladly render support to the cause if the matter were brought to their attention. The American Forestry Association is endeavoring to reach such persons all over the country, but it is certain that a very large number who would gladly accept membership are lost through inability to present to them the aims of the association.

Therefore the officers of the association submit this appeal to its members and friends: Lend your assistance in securing additional members. Forward to H. M. Suter, Secretary, 1311 G street northwest, Washington, D. C., the names of friends or acquaintances whom you think would be interested in forestry and the work of the American Forestry Association. Information will be gladly sent to all.

**The Growing Forest Service**

Some idea of the magnitude and variety of the operations of the United States Forest Service may be gained from one of the recent publications of that bureau, showing field assignments for June. In addition to the administrative work in connection with forest reserves, the service is prosecuting a very large number of examinations of lands for new forest reserves throughout the West. Special studies of specific phases of forestry are being pursued in a number of States. The problem of forest planting—particularly throughout the West—and the institution of nurseries for the propagation of seedlings has a prominent place in the work of the service. The preparation of planting plans for private owners occupies a number of its employees in a large number of States, and coöperative work with States, various other Governmental departments, municipalities, corporations, and individuals, is under way. The possibilities of treated timbers, experiments in preservation processes, and the strength of various timbers, is being investigated. Statistics relating to the consumption of forest products, etc., are being collected, and the publication section is constantly issuing publications and reports of various investigations. Improved methods of turpentining are being pursued in Florida, in coöperation with a large corporation; experiments are being conducted in Massachusetts to determine the value of various woods for pulp; in Michigan the cross-tie problem is being studied, in coöperation with the Chicago and Northwestern and the Wisconsin Central railroad companies; in Pennsylvania, a preliminary study is being made to determine a forest policy for the Pennsylvania Railroad Company; and coöperation with the Reclamation Service is carried on largely throughout its field of operations.

Altogether forestry in the United States has already become an important economic factor. The rapidity of its progress is most evident in a comparison of Government and State activities and appropriations of the present and a half dozen years ago.

**Rhode Island Forester**

Jesse B. Mowry, who was recently appointed by Gov. George H. Utter commissioner of forestry for Rhode Island, is considered well qualified for the duties of the office, having made a long study of the subject. Mr. Mowry is a native of the town of Glocester and is superintendent of public schools in that place.

He received his early education in the schools of Glocester and took a course of study in the Rhode Island State Normal School. After leaving the Normal School he entered Norwich University, where he received the degree of Bachelor of Science and then entered Brown University where he took up the study of chemistry.

Leaving his studies in Brown University, he was appointed officer in charge of the barracks at Norwich University, where he served two years. He has taught schools in several places, has been sub-master of high schools in Massachusetts, a professor of botany and geology in Grand Is-

land College, Nebraska, and in the Leonard School of Pharmacy. In addition to his duties as superintendent of schools of Glocester, Mr. Mowry is a member of the faculty of the Pentecostal Collegiate Institute, Scituate, and a member of the American Chemical Society.

In speaking of the opportunities and possibilities that lie in the unimproved and abandoned farms of Rhode Island, the new commissioner recently said:

"There are in this State about 268,000 acres of unimproved and abandoned farm land. Much of it has always been unsuitable for agriculture and a great deal of it has now reverted to forests. The shifting of the grain and meat producing industries westward has greatly lessened the requirements of tillage and pasture land in the State, but it is none the less important that the large area of unimproved land should be put to the best possible use.

"A great deal of the land is ledgy and some of it is so poor that it should be allowed to produce what it can naturally while more of it should prove remunerative if devoted to forest planting. The natural afforestation is slow and many times unsatisfactory. Twenty years and more elapse before the land is covered with trees and many of these are of the less valuable species. This delay is unnecessary and may be avoided by forest planting, and many instances to pine and hard woods at a small outlay, has produced four or five times as much valuable timber per acre in forty years as would have been produced by natural afforestotion.

"The long investment discourages the planter, but he should keep in mind that the land so planted is increasing in value and is released from taxation for a period of fifteen years. In the rugged ridges, where forest planting would be unprofitable and where we now find the forests of evergreens mixed with hardwoods, forest management would greatly improve the value. There is a very small percentage of the woodland in the State that is producing as large a money return as it is capable of doing. The imported pine, maple, oak and other woods range higher in price than native products because the latter has become inferior in quality and dimensions.

"The nation's supply of white pine, which is our most useful tree for commercial purposes, is fast decreasing, and the valleys of Rhode Island's many small rivers, which are too light and sandy for profitable tillage, form natural places for the best production of this species. The largest specimen in North America that I know of is found in the town of Glocester, but within the past few years many acres of this land has been cut off. Very few if any of the mother trees are left and the land is growing up with birch, scrub oak and brush.

"With better laws to protect the planters from forest fires this area could be made again to yield a heavy growth of timber, and if taken in time under forestry methods the tree weeds now occupying the ground would serve as a shade and protection to the pine seedlings. In States like Michigan nature has produced only about 5,000 feet per acre of pine, while experiments in New England have proven that five times that amount can be grown per acre and harvested by the man who in youth plants the pine seed."

**Forest Instructor Wanted**

An assistant to the director of the recently created School of Forestry at Colorado Springs, Colo., is wanted. His duty will be to give elementary instruction in forestry. The salary will be $1,200 a year, with a prospect for advancement if the work done is satisfactory. Applications for this position should be made to the Forester, United States Forest Service, Washington, D. C.

**Irrigation in Hawaii**

The Kohala Ditch, the biggest irrigation enterprise of the kind in the Hawaiian Islands, was opened June

Granite Knob in the Southern Appalachian Mountains from which the forest, and later the soil has been largely removed.

Badly Washed Mountain Valley Lands, Bakersville, N. C. The lower slopes bordering this valley are largely cleared.

11, with ceremonies, in which Secretary Atkinson, lately acting governor, took part. The ditch at present runs fourteen miles, of which nine are mountain tunneling, and it will eventually be seventy miles long and will supply 70,000,000 gallons of water per day to numerous plantations and to large areas of land which are now uncultivated through the lack of water. The ditch as far as at present constructed cost $500,000. In the course of his address at the opening of the ditch, Secretary Atkinson quoted a letter from President Roosevelt, in which the latter pledges his support to efforts to secure immigrants who will settle on the lands of Hawaii. The President in his letter, which was addressed to Mr. Atkinson while the latter was acting governor, says that he will do all in his power to assist in the matter.

**Lower Yellowstone Project**

Public interest in national irrigation has been heightened by the progress of the work on the Lower Yellowstone reclamation project. This project in eastern Montana and western North Dakota contemplates the reclamation of 67,000 acres of land, two-thirds of which is in Montana. The canal takes its supply from the Lower Yellowstone River at a point about seventeen miles below Glendive, and extends down the left or west side of the river at total length of 80 miles.

Contracts have been awarded and construction is now proceeding on all but one of the divisions of this work. Bids were recently opened for constructing the main diverting dam across the river. This will be a timber crib and rock structure 600 feet long and 12 feet in height. It will serve to divert the low flow of the Yellowstone River into the main canal. The canal when completed will have a capacity of 1,700 acre-feet of water every twenty-four hours.

The initiation of the work has started a boom in real estate all over the valley. A great many new settlers have already arrived and others are coming in every day. Many new buildings have been erected and others are in process of construction. Land for which there was very little sale at any price is now selling at $25 and upward an acre.

**Progress on Huntley Work**

The Huntley irrigation project on the ceded portion of the Crow Indian Reservation, Mont., is attracting a great deal of attention just now by reason of the opening of the reservation to settlement under the general land laws on August 15.

Although no definite arrangements have been made as to the method of opening the land under the irrigation project, it is probable that some similar form of drawing will be adopted as heretofore used in connection with the opening of other lands. Contracts have been awarded and construction is being rapidly pushed on all the work of the Huntley project. It is expected that the land under the irrigation system will be opened to settlement within a few months.

This project, which embraces approximately 50,000 acres, has a maximum length of thirty miles and extends along the right bank of the Yellowstone River, excepting at a point twelve miles east of Billings. It is traversed throughout its entire length by the Northern Pacific Railroad, and is crossed by the Chicago, Burlington and Quincy. Both of these railroads are arranging to establish stations every five miles, which will give the settlers under this project exceptionally good railroad and shipping facilities. Arrangements are also being perfected by the Reclamation Service for availing of the benefits of the recent town site bill passed by Congress whereby a small tract of land conveniently located and surrounding the railway stations can be subdivided and sold to settlers and others. By this arrangement each farm unit will have stores, post-office, schools, and churches within an average of less than two miles.

**MR. WESLEY J. GARDNER**
Whose death removes an able member from the United States Forest Service

Mr. Wesley J. Gardner, Forest Assistant in the Forest Service, died at the Episcopal Eye, Ear, and Throat Hospital in Washington, D. C., on June 15th. Mr. Gardner was born in Plainfield, N. J., January 30, 1877. He graduated from Harvard University in 1900 with an A. B. degree, and from Yale Forest School in 1903. His connection with the Forest Service dates from 1900, during which time he has been engaged in important investigations in various Western States. Conscientious devotion to his work and a quiet, refined manner were his characteristics at all times. His early death will be a life-long regret to his many friends and a serious loss to the Service.

# EARTHQUAKES AND THE FOREST*

BY

MYRON L. FULLER
United States Geological Survey.

THE question of the relation of earthquakes to the forest is particularly pertinent at this time when the public interest, aroused by the recent terrifying shock and appalling conflagration at San Francisco, is still at a high pitch. In the accounts of the destruction wrought by these great convulsions of nature, little is usually said of the effect of the disturbances on the forest growth. Nevertheless, there is hardly a shock, at least of the severe ones, which does not affect it to a greater or less extent. In some instances the havoc wrought is both widespread and complete.

Earthquake waves may be popularly divided into (1) vibrations and (2) actual visible waves like the broad low swells of the ocean. The former are felt as relatively sharp and sudden jars, or shakings of the ground, while during the passage of the latter the earth is felt to rise, sway, and fall with the sickening motion so vividly impressed upon everyone who has experienced it. The sharp vibrations are often destructive to artificial structures, chimneys being snapped off, masonry walls parted and shattered, and buildings jarred from their foundations. To the larger earth waves are to be ascribed most of the twistings of the surface, the warping and folding of the ground, the fissuring of the soil, and the slipping of the hillside materials, as well as the destruction of buildings and other works of man.

Usually, however, the vibrations are not sharp enough to seriously affect the forests, although in the case of certain of the heavier shocks trees are said to have been snapped off short near their butts, but the landslides arising from the larger waves, aided perhaps by the vibrations, are often very destructive to the trees of the steeper hillisdes. Not only are the trees directly overthrown by the shock, but by the warping of the surface and the formation of swamps and lakes through the obstruction of drainage, large numbers are often killed by submergence. Of our three greatest earthquakes—the famous New Madrid earthquake which shook the Mississippi valley in 1811 and 1812, the Charleston earthquake of 1886, and the San Francisco of April 18th of this year—only the former had a marked effect on the forests. At Charleston, notwithstanding the severity of the shock, there was almost no effect on the trees, which remained upright and unbroken. In the San Francisco region, the action was somewhat greater, the trees of the slopes and hillsides often being tilted and overthrown by slippings started by the shock, but on the whole the forests were but little affected. Not so, however, was it in the case of the New Madrid area in which, as described in the following paragraphs, the destruction was great.

New Madrid, from which the earthquake of 1811-1812 was named, is a small town on the banks of the Mississippi in southeastern Missouri not far from the Arkansas line. It was near here that the earthquake reached its maximum intensity, but its area of destruction reached westward to the St. Francis River, eastward into Tennessee, and southward nearly to the present site of Memphis. The first shock was felt at 2 A. M. on December 16, 1811, being sufficient to awaken the settlers and to cause them to rush to the open to escape the falling chimneys and other objects. Here they re-

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mained until morning, when a second shock, much heavier and more destructive than the first, brought renewed consternation upon them. This shock, according to an observer, was preceded by a rumbling like distant thunder. A moment later "the earth began to totter and shake so that persons could neither stand nor walk. Then the earth was observed to roll in waves a few feet high with visible waves between. By and by these

**Fig. 1—Earthquake crack filled with sand forced up from below during New Madrid earthquake, Charleston, Mo. (Photo loaned by Mr. Thomas Beckwith.)**

swells burst, throwing up large volumes of water, sand, and coal [lignite] (Fig. 1). When the swells burst, fissures were left running in a northern and southern direction and parallel for miles." After the severest shocks a dense black "sulphurous" vapor, due to gases derived from long buried timber and vegetable muck and issuing from the cracks, tainted the water for many miles around. From the cracks there were also thrown out sand and water which covered the ground over large areas. The surface sunk in places, giving rise to swamps and lakes, while elsewhere it was uplifted and its bayous drained. (Fig. 2.)

**Fig. 2—View in sunk Lands formed by New Madrid Earthquake southeastern Missouri, showing old timber in foreground, mostly killed by submergence, with young timber in background.**

The effect on the forests has been described by many observers. One, speaking of the first shock, says "the affrighted inhabitants ran to and fro. The fowls and beasts cried; trees fell." Again speaking of a shock on February 7th, the same observer says: "At first the Mississippi seemed to recede from its banks, its waters gathered up like mountains, leaving boats high upon the sands. The waters then moved inward with a front wall 15 to 20 feet perpendicular. * * * The river fell as rapidly as it had risen and receded within its banks with such force that it took with it the grove of cottonwood trees which hedged its borders. They were broken off with such regularity that in some instances persons who had not witnessed the fact could with difficulty be persuaded that it was not the work of art."

Another writer, speaking of the cracks, says, "oak trees would be split in the center and for 40 feet up the

trunk, one part standing on one side of a fissure, the other part on the other. * * * Near the St. Francis River there is a great deal of sunk land caused by the earthquake of 1811. Here are large trees sunk 10 or 20 feet beneath the water. * * * In Reelfoot Lake [Tennessee] the fisherman floats his canoe above the branching submerged tops of cypress trees." These submerged trees after struggling with the changed conditions for the most part finally died and their bare trunks may still be seen among the younger growth of cypress which is now taking possession of the old swamps. On the Mississippi, according to another observer, "The sandbars and points of islands gave way, swallowed up in the tumultuous bosom of the river, carrying down with them the cottonwood trees cracking and crashing, tossing their arms to and fro as if sensible of their danger, while they disappeared beneath the flood." Still another says the "roaring and whistling produced by the impetuosity of the air escaping from confinement, seemed to increase the horrid disorder of trees being blown up, cracked and split and falling by thousands at a time."

**Fig. 3—Trees tilted by landslides caused by New Madrid Earthquake. Reelfoot Lake, Tennessee**

Still another prominent source of destruction was the landslides occurring along the steep Chickasaw Bluffs which border the Mississippi lowlands on the east in Kentucky and Tennessee. These bluffs, consisting of more or less clayey deposits, were already nearly as steep as the material could stand and needed only the shock of the earthquake to inaugurate the slip-

ping. The face of the bluff literally crumbled under its action; wide rents opened and great masses slipped and slid downward, carrying with them the immense trees which covered the surface, and mingling both earth and timber in confused jumbles at the bottom. Two of the present views (Figs. 3 and 4) show trees overthrown by the slides at this time. In one the original trees survived, gradually straightening to an upright position; in the other the old broken trunk is decayed and gone, the present tree being developed from one of the original limbs.

**Fig. 4.—Tree overturned and partly killed by New Madrid Earthquake, Reelfoot Lake, Tennessee**

Of all the causes of destruction which have been enumerated, that caused by the submergence of the land was most widespread. The most important single instance was the formation of Reelfoot Lake, which covered an area of 25 miles long and 5 miles wide. Originally a small stream, know as Reelfoot Creek, flowed through the region, but at the time of the earthquake the land was upheaved across the lower portion and the waters dammed back to form the great lake, now so well known from the large quantities of fish taken from it each year. The region at the time of the shock was well wooded, much of it being covered with species characteristic of dry situations. Over a large part of the area the timber remained upright after the shock, but was gradually killed by the rising waters. In Figure 5 is shown a view of such timber standing in about 15 feet of water. Elsewhere, however, the timber was prostrated, forming a network of trunks, which even now can be seen

**Fig. 5—Timber killed by submergence due to New Madrid Earthquake. Reelfoot Lake, Tennessee**

beneath the waters of the lake, or, as shown in Figure 6, projecting slightly above its surface.

Briefly summarizing the results of the earthquake on the forest, we find that its effects included the splitting of

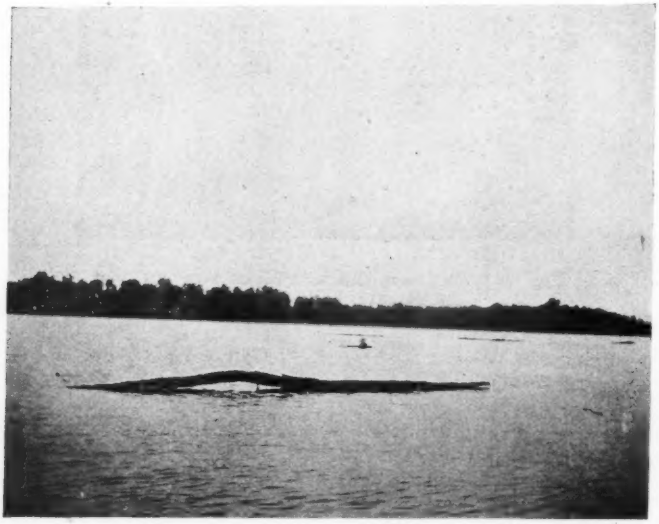


**Fig. 6—Timber prostrated and submerged by New Madrid Earthquake. Reelfoot Lake, Tennessee**

trunks, the inclination of trees and interlocking of branches, the prostration of considerable tracts of forest, the snapping off of the trunks by the rush of waters near the Mississippi, the precipitation of trees into the streams by caving banks, the complete uprooting and removal of the entire vegetable covering of many of the islands (which themselves, in some instances, were completely destroyed), the overturning and prostration by landslides, and the submergence of great areas by ponded waters.

Over how great an area the forests were destroyed is difficult to say at the present time. Reelfoot Lake alone probably covered 125 square miles of forest, while the swamps formed at this time to the west of the Mississippi probably covered 75 square miles or more in addition. These two causes alone would account for the destruction of over 125,000 acres. The amount of timber lost by the caving of the banks and by the overwhelming of the islands would probably bring the total to 150,000 acres. To this still further additions must be made of the areas in which the timber was overthrown by landslides or other causes. No estimate of this can now be made, but it was undoubtedly considerable. That the destruction was sufficient to give earthquakes a place among the enemies of the forest can not be disputed.

# AGRICULTURAL SETTLEMENT IN FOREST RESERVES

## Important Law Enacted by Congress Affecting Settlers in Reserves

BY

GEORGE W. WOODRUFF
In Charge of Section of Law, United States Forest Service.

THE enemies, and even the more critical friends, of forest reserves have harped upon the fact that, no matter how much care is exercised in choosing forest reserve boundaries, it is impossible to avoid the inclusion of land actually valuable for agriculture. Those who are hostile to the reserves declare that these areas are large and valuable, and that their inclusion in the forest reserve takes away from the people a much-desired opportunity to build homes and thriving communities. Fair-minded critics, on the other hand, although they admit that the tracts are small and isolated, have deplored the necessity of withholding any purely agricultural land from use by homestead settlers.

The Forest Service aimed to remedy this difficulty in the past by issuing permits to cultivate agricultural areas, not exceeding 40 acres, to any person who would actually live upon and cultivate such tracts. In addition it allowed such permittees to take, without charge, sufficient forest reserve timber for fences and buildings in connection with the enjoyment of the agricultural privilege. Recently the Secretary of Agriculture has approved a regulation to take effect July 1, that such agricultural permits may be allowed by the Forester to the maximum of 160 acres. By this means, those willing to make their homes in the forests, were and are offered an opportunity to do so.

There was one drawback, however, namely that such permittees lacked one great incentive to improve their homes to the utmost. It was impos-

sible under the land laws to obtain title to forest reserve land, and they hesitated about planting orchards or even building thoroughly comfortable homes for fear that in the future, either through whim or through needing the land for administrative purposes, the Forester might revoke their permits and eject them from the reserve. The Forester was so keenly alive to this hardship and deterring influence that he recommended to Congress, even before the forest reserves were transferred to his care, that a law be passed to give opportunity, under reasonable restrictions, for acquiring the title to forest reserve lands chiefly valuable for agriculture. A bill to this effect was introduced in the Second and again in the Third Session of the Fifty-eighth Congress, but failed of passage. Last winter, however, Mr. Lacey reintroduced the bill and accepted several valuable amendments suggested by the Forester and by local interests. In its amended form the bill was finally signed by the President June 11, 1906. It reads as follows:

*Be it enacted, etc.,* That the Secretary of Agriculture may, in his discretion, and he is hereby authorized, upon application or otherwise, to examine and ascertain as to the location and extent of lands within permanent or temporary forest reserves, except the following counties in the State of California: Inyo, Tulare, Kern, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Orange, Riverside, and San Diego; which are chiefly valuable for agriculture, and which, in his opinion, may be occupied for agricultural purposes without injury to the forest reserves, and which are not needed for public purposes, and may list and describe the same by metes and bounds, or otherwise, and file the lists and descriptions with the Secretary of the Interior, with the request that the said lands be opened to entry in accordance with the provisions of the homestead laws and this Act.

Upon the filing of any such list or description the Secretary of the Interior shall declare the said lands open to homestead settlement and entry in tracts not exceeding one hundred and sixty acres in area and not exceeding one mile in length, at the expiration of sixty days from the filing of the list in the land office of the district within which the lands are located, during which period the said list or description shall be prominently posted in the land office and advertised for a period of not less than four weeks in one newspaper of general circulation published in the county in which the lands are situated: *Provided,* That any settler actually occupying and in good faith claiming such lands for agricultural purposes prior to January first, nineteen hundred and six, and who shall not have abandoned the same, and the person, if qualified to make a homestead entry, upon whose application the land proposed to be entered was examined and listed, shall, each in the order named, have a preference right of settlement and entry: *Provided further,* That any entryman desiring to obtain patent to any lands described by metes and bounds entered by him under the provisions of this Act shall, within five years of the date of making settlement, file, with the required proof of residence and cultivation, a plat and field notes of the lands entered, made by or under the direction of the United States surveyor-general, showing accurately the boundaries of such lands, which shall be distinctly marked by monuments on the ground, and by posting a copy of such plat, together with a notice of the time and place of offering proof, in a conspicuous place on the land embraced in such plat during the period prescribed by law for the publication of his notice of intention to offer proof, and that a copy of such plat and field notes shall also be kept posted in the office of the register of the land office for the land district in which such lands are situated for a like period; and further, that any agricultural lands within forest reserves may, at the discretion of the Secretary, be surveyed by metes and bounds, and

that no lands entered under the provisions of this Act shall be patented under the commutation provisions of the homestead laws, but settlers, upon final proof, shall have credit for the period of their actual residence upon the lands covered by their entries.

Sec. 2. That settlers upon lands chiefly valuable for agriculture within forest reserves on January first, nineteen hundred and six, who have already exercised or lost their homestead privilege, but are otherwise competent to enter lands under the homestead laws, are hereby granted an additional homestead right of entry for the purposes of this Act only, and such settlers must otherwise comply with the provisions of the homestead law, and in addition thereto must pay two dollars and fifty cents per acre for lands entered under the provisions of this section, such payment to be made at the time of making final proof on such lands.

Sec. 3. That all entries under this Act in the Black Hills Forest Reserve shall be subject to the quartz or lode mining laws of the United States, and the laws and regulations permitting the location, appropriation, and use of the waters within the said forest reserves for mining, irrigation, and other purposes; and no titles acquired to agricultural lands in said Black Hills Forest Reserve under this Act shall vest in the patentee any riparian rights to any stream or streams of flowing water within said reserve; and that such limitation of title shall be expressed in the patents for the lands covered by such entries.

Sec. 4. That no homestead settlements or entries shall be allowed in that portion of the Black Hills Forest Reserve in Lawrence and Pennington counties in South Dakota except to persons occupving lands therein prior to January first, nineteen hundred and six, and the provisions of this Act shall apply to the said counties in said reserve only so far as is necessary to give and perfect title of such settlers or occupants to lands chiefly valuable for agriculture therein occupied or claimed by them prior to the said date, and all homestead entries under this Act in said counties in said reserve shall be described by metes and bounds survey.

Sec. 5. That nothing herein contained shall be held to authorize any future settlement on any lands within forest reserves until such lands have been opened to settlement as provided in this Act, or to in any way impair the legal rights of any bona fide homestead settlers who has or shall establish residence upon public lands prior to their inclusion within a forest reserve.

To prepare the Forest Supervisors for the rush of applications, which was likely to follow the passage of this bill, and to inform the public of the first steps to be taken toward having agricultural lands examined, classified, and listed preparatory to opening them for settlement and entry, the Forester issued the following general instructions:

To Forest Officers in Charge:

In order that you may be prepared to perform your duties under the Agricultural Settlement Act of June 11, 1906, you will please notice:

1. That the Secretary of Agriculture may use his discretion about examining and listing lands under the law.

2. Only lands chiefly valuable for agriculture and not needed for administrative purposes by the Forest Service or for some other public use will be classified and listed under this Act.

3. Land covered with a merchantable growth of timber will not be declared agricultural, except upon the strongest evidence of its value for agricultural purposes, both as to production and accessibility to a market.

4. Areas known to have been occupied by actual settlers prior to January 1, 1906, will be examined first, and when such areas are found chiefly valuable for agriculture they will be listed, in order that the occupants may make entry under the Act. The mere

fact that a man has settled upon land will, however, not influence the decision with respect to its agricultural character.

5. Any one who was a *bona fide* settler on land within a forest reserve before January 1, 1906, but who has already exercised or lost his homestead privilege, may, if otherwise qualified, make homestead entry under the provision of the proposed law, but must pay $2.50 per acre for any lands entered.

6. The first preference right to enter lands classified and listed under the Act will be given to persons who settled upon such lands prior to January 1, 1906. The second preference right to enter any particular listed tract will be given to persons who apply to have the classification made, but this latter class should not apply for the classification of a tract occupied by a settler before that date; otherwise, they might lose their preference rights.

7. Supervisors are often absent from their headquarters, and so can not be reached at all times with equal certainty by all applicants. To avoid any undue advantage of one applicant over another due to this cause, all applications under this Act must be forwarded by mail to the Forester, Washington, D. C., by the applicants.

8. Applications dated and mailed before the bill had become a law will have no value and the Forester will return them at once, notifying the sender that he may apply again.

9. All applications received in Washington in the same mail for the examination of the same tract will be treated as simultaneous, and simultaneous applicants will be notified. A similar notice will be given to the later of two applicants for the examination of the same tract.

10. No examination of more than one quarter-section will be ordered upon the application of the same person, but if an application is withdrawn or rejected a second application will be received for other land.

11. All applications must give the name of the forest reserve and describe the land, examination of which is requested, by legal subdivisions, section, township, and range, if surveyed, and if not surveyed, by reference to natural objects, streams, or improvements with sufficient accuracy to identify the land.

12. Forest officers must not make application for the examination and listing of lands under this Act.

13. Instructions governing the allowance of entries to be made under the Act after the listing will be issued by the Interior Department.

14. When notified that the bill has become a law the Supervisors should inform the public as fully as practicable.

15. The Act expressly provides that no settlement on any lands within forest reserves is authorized until they have been publicly declared open to settlement by the Secretary of the Interior. Any settlement on such lands prior to the opening by the Secretary of the Interior will not only confer no rights on the settler but will constitute trespass.

16. You will please be diligent in discovering and preventing any such trespasses and report them promptly to the Forester.

17. Please give the widest possible publicity to this order to discourage such settlement and to prevent loss and trouble to intending settlers.

It will be impossible, with the official force and funds at the Forester's command, to list agricultural land within forest reserves as soon as the applicants may wish. The first effort will be to place people who were actually living within the reserve on January 1, 1906, and who are technically trespassers, in the proper position by examing and listing their lands, if they are found chiefly valuable for agriculture. Thereafter all purely agricultural lands within forest reserves will be brought within the reach of would-be homestead settlers as soon as practicable. There is some danger that

hostile critics may carp at the necessary delay, but within a reasonable time we may hope to see all forest reserve lands which is suitable for homemaking, occupied by thrifty families.

It is hoped and believed that these settlers will find that their own best interests are bound up in the protection of the forest reserves from fire and trespass, and that they will become a great supplementary and volunteer ranger force, helping to protect and improve the reserves, and ultimately finding employment and a market for their farm products in the lumber and wood industries, which will soon and continuously be carried on within the National forests.

# IMPORTANT IRRIGATION LEGISLATION

## Bills Passed by Congress Which Affect the Working of the Reclamation Act

ON JUNE 18, the Senate adopted the conference report on what may the conference report on what may be called a sort of Omnibus Bill relating to the Reclamation Act. The bill (H. R. 18536) is entitled, "An Act providing for the subdivision of lands entered under the Reclamation act, and for other purposes."

The first section provides that the Secretary of the Interior may establish farm units of not less than ten nor more than 160 acres whenever by reason of market conditions and the special fitness of the soil and climate for the growth of fruit and garden produce under a project, a smaller area than forty acres may be sufficient for the support of a family.

This corrects a serious defect in the original Reclamation Act, which made the smaller limit of the homestead entry forty acres. In many cases, such as projects in the southern part of the country, or projects elsewhere, when the conditions of soil and climate were favorable to fruit and the higher grade of products, a farm of forty acres is far more than would be necessary for the support of a family, and, indeed, too great an area for one man to properly irrigate under the intensive form of cultivation necessary to produce the more valuable crops.

This section also permits the Secretary of Interior to have the necessary subdivision surveys of the public lands for farm units less than forty acres made by the Reclamation Service.

Section 2 provides that whenever it has been necessary under the provisions of the Reclamation Act to acquire by relinquishment lands covered by a bona fide unperfected entry, the entryman may be permitted to make another entry as though his former entry had not been made.

This meets a condition, which in some cases is a hardship upon a settler who might otherwise lose his homestead right, because the land included in his entry is necessary for a reclamation project.

The Secretary of the Interior has already decided that under certain conditions an entryman, who is required to give up his land, could make another entry. This proposed act bases the right of the entryman upon a statute rather than upon the interpretation of the Secretary of the Interior.

Section 3 provides that townsites which have been set apart by the President under the provisions of Sections 2380 and 2381 of the United States Revised Statutes, within or near any reclamation project may be

disposed of under the provisions of the recent townsite act of April 16, 1906.

The necessity for this legislation is due to the fact that the Commissioner of the General Land Office had no funds available for the disposition of certain townsites withdrawn under the Minidoka project in pursuance of a proclamation of the President under these sections of the Revised Statutes. Bills have been introduced at the present session of Congress for the necessary appropriations, but have not yet passed and there was much urgency for the disposition of these townsites.

Section 4 provides that in two of the townsites on the Minidoka project, which had been withdrawn, namely, Heyburn and Rupert, settlers who have established themselves thereon prior to March 5, 1906, in permanent buildings not easily moved, shall be permitted to purchase the lots built upon at an appraised valuation for cash.

The conference report adds a provision that the limitation of townsites in connection with reclamation projects in the recent act of April 16, 1906, to 160 acres, shall be repealed. This will enable the Secretary of the Interior to make withdrawals of townsites of such size as in his opinion the public interest may require.

A townsite of 160 acres is very small for such large areas as are involved in a number of projects, when the country was not settled upon at the time of the beginning of the project. The proposed modification of the townsite act will enable the Secretary of the Interior to provide adequate townsite facilities in many cases where, under the act as it now stands, townsites of 160 acres would be entirely insufficient.

Section 5 provides that desert land entrymen, whose lands may be included in a reclamation project, and who may be directly or indirectly hindered or prevented from making improvements and reclaiming the lands under the desert land act, shall be allowed an extension of time equal to the loss on account of such hindrance. It also provides that desert land entrymen within reclamation projects which are undertaken shall relinquish all lands embraced within the entry in excess of 160 acres, and as to such 160 acres they may make final proof and obtain patent upon compliance with the terms of the Reclamation Act. The section, however, does not require a desert land entryman, who owns a water right and reclaims the land embraced in his entry, to accept the conditions of the Reclamation Act.

The Representatives of the House and Senate having agreed upon this bill and the report having been adopted by the Senate, it is probable that it will likewise be adopted by the House and may therefore soon become a law.

While there may be features in this act that cannot be regarded as legislation of the wisest character, yet there are many provisions corrective of the defects in previous acts which are very valuable, and will undoubtedly aid in the successful application of the Reclamation Act to the construction of projects and the reclamation of the desert lands.

A copy of the act as agreed upon by the conferees follows:

An Act providing for the subdivision of lands entered under the Reclamation Act, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever, in the opinion of the Secretary of the Interior, by reason of market conditions and the special fitness of the soil and climate for the growth of fruit and garden produce, a lesser area than forty acres may be sufficient for the support of a family on lands to be irrigated under the provisions of the Act of June 17, 1902, known as the Reclamation Act, he may fix a lesser area than forty acres as the minimum entry and may establish farm units of

not less than ten nor more than one hundred and sixty acres. That wherever it may be necessary, for the purpose of accurate description, to further subdivide lands to be irrigated under the provisions of said Reclamation Act, the Secretary of the Interior may cause subdivision surveys to be made by the officers of the reclamation service, which subdivisions shall be rectangular in form, except in cases where irregular subdivisions may be necessary in order to provide for practicable and economical irrigation. Such subdivision surveys shall be noted upon the tract books in the General Land Office, and they shall be paid for from the reclamation fund: Provided, That an entryman may elect to enter under said Reclamation Act a lesser area than the minimum limit in any State or Territory.

SEC. 2. That wherever the Secretary of the Interior, in carrying out the provisions of the Reclamation Act, shall acquire by relinquishment lands covered by a bona fide unperfected entry under the land laws of the United States, the entryman upon such tract may make another and additional entry, as though the entry thus relinquished had not been made.

SEC. 3. That any town site heretofore set apart or established by proclamation of the President, under the provisions of sections 2380 and 2381 of the Revised Statutes of the United States, within or in the vicinity of any reclamation project, may be appraised and disposed of in accordance with the provisions of the Act of Congress approved April 16, 1906, entitled "An Act providing for the withdrawal from public entry of lands needed for town-site purposes in connection with irrigation projects under the Reclamation Act of June 17, 1902, and for other purposes;" and all necessary expenses incurred in the appraisal and sale of lands embraced within any such town site shall be paid from the reclamation fund, and the proceeds of the sales of such lands shall be covered into the reclamation fund.

SEC. 4. That in the town sites of Heyburn and Rupert, in Idaho, created and surveyed by the Government, on which town sites settlers have been allowed to establish themselves, and had actually established themselves prior to March 5, 1906, in permanent buildings not easily moved, the said settlers shall be given the right to purchase the lots so built upon at an appraised valuation for cash, such appraisement to be made under rules to be prescribed by the Secretary of the Interior.

Providing that the limitation on the size of town sites contained in the act of April 16, 1906, entitled "An Act providing for the withdrawal from public entry of lands needed for town-site purposes in connection with irrigation projects under the Reclamation Act of June 17, 1902, and for other purposes," shall not apply to the town sites named in this section and whenever, in the opinion of the Secretary of the Interior, it shall be advisable for the public interest, he may withdraw and dispose of town sites in excess of 160 acres under the provisions of the aforesaid act approved April 16, 1906, and reclamation funds shall be available for the payment of all expenses incurred in executing the provisions of this act, and the aforesaid act of April 16, 1906, and the proceeds of all sales of town sites shall be covered into the reclamation fund.

SEC. 5. That where any bona fide desert-land entry has been or may be embraced within the exterior limits of any land withdrawal or irrigation project under the Act entitled "An Act appropriating the receipts from the sale and disposal of public lands in certain States and Territories to the construction of irrigation works for the reclamation of arid lands," approved June 17, 1902, and the desert-land entryman has been or may be directly or indirectly hindered, delayed, or prevented from making improvements or from reclaiming the land embraced in any such entry by reason of such land withdrawal or ir-

rigation project, the time during which the desert-land entryman has been or may be so hindered, delayed, or prevented from complying with the desert-land law shall not be computed in determining the time within which such entryman has been or may be required to make improvements or reclaim the land embraced within any such desert-land entry: Provided, That if after investigation the irrigation project has been or may be abandoned by the Government, time for compliance with the desert-land law by any such entryman shall begin to run from the date of notice of such abandonment of the project and the restoration to the public domain of the lands withdrawn in connection therewith, and credit shall be allowed for all expenditures and improvements heretofore made on any such desert-land entry of which proof has been filed; but if the reclamation project is carried to completion so as to make available a water supply for the land embraced in any such desert-land entry, the entryman shall thereupon comply with all the provisions of the aforesaid Act of June 17, 1902, and shall relinquish all land embraced within his desert-land entry in excess of 160 acres, and as to such 160 acres retained, he shall be entitled to make final proof and obtain patent upon compliance with the terms of payment prescribed in said Act of June 17, 1902, and not otherwise. But nothing herein contained shall be held to require a desert-land entryman who owns a water right and reclaims the land embraced in his entry to accept the conditions of said Reclamation Act.

On June 9, 1906, the President approved "An Act to provide for the disposition, under the public land laws, of lands within the abandoned Fort Shaw Military Reservation, Mont." The act is brief and its terms can be readily understood from the following text:

An Act to provide for the disposition under the public land laws of the lands in abandoned Fort Shaw Military Reservation, Mont.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized to dispose of the lands in the abandoned Fort Shaw Military Reservation, in Montana, under the provisions of the public land laws, and the public land surveys shall be extended over the lands therein: Provided, That he may reserve for Indian school purposes the following-described lands in township twenty north, range two west, Montana principal meridian, as determined by the extension of the public surveys: That portion of section two lying south of Sun River, all of sections eleven, fourteen, and twenty-three, and that portion of section twenty-six lying within the present reservation boundry: Provided further, That before opening the reservation to entry, the Secretary of the Interior may withdraw any other lands therein needed in connection with an irrigation project under the provisions of the Act of June 17, 1902, known as the Reclamation Act, for use or disposition thereunder.

The lands in the Fort Shaw Military Reservation will form an important part of the Sun River project in Montana, and the fact that this area of 29,843 acres, which contains 17,500 acres of irrigable land, was not open to disposition under the Reclamation Act excluded from the Sun River project some of the best lands which could have been irrigated under the system.

This large area was unused except for the Indian school, which was established there some years ago. The school could properly use but a very small portion of the land and this act consequently sets apart about 2,200 acres, which includes the lands already improved by the school and is supposed to be ample for all its purposes.

The passage of this act will simplify the development of the Sun River project and add to it a considerable area of valuable land.

# PROGRESS OF SHOSHONE PROJECT

BY

H. N. SAVAGE

WORK on the two principal structures in connection with this project has now assumed an interesting stage. The temporary works for the great Shoshone dam, which is to be the highest in the world, have been completed so far as possible and are now handling the annual flood. A tunnel, 500 feet long, has been driven through the rock ledge along the dam site, and a temporary dam has been completed across the stream, 1,000 feet above the tunnel. A flume takes the water from this temporary dam and conducts it to the tunnel. The contractors are also damming the permanent spillway tunnel. This is located 240 feet above the bed of the stream and has a cross section of 20 feet square, and will have a discharge capacity of 20,000 cubic feet of water per second, ample provision being thus made for handling the greatest flood the river can produce.

The big plant for crushing the rock and sand, (all sand for the masonry work being crushed from the granite,) and for mixing the concrete and also for excavating and handling the material from the dam site, is being erected. Two Lidgerwood cables, each having a span of over 1,000 feet, are being assembled and will be erected as soon as the flood will permit. Cement is being hauled from Cody station, 8 miles away, and stored at the dam site, every provision being made to commence excavating and construction work on the main structure at the earliest possible date when the flood shall have subsided sufficiently to permit.

The water impounded behind the Shoshone dam will be first conducted 10 miles down the main channel of the river, and then diverted by means of a tunnel 3½ miles long out upon the land to be irrigated. This tunnel is ten feet square in cross sections and will have a capacity of 2,000 acre-feet of water every 24 hours. Construction work is being rapidly pushed. About 400 men are now at work, the nature of the material encountered being exceptionally favorable for rapid excavating. The soft sandstone can easily be drilled by the use of coal-boring auguers. These are driven by compressed air. Frequently a hole six feet in depth is driven in six minutes. The tunnel was located with special reference to rapid construction. Ten headings have been opened up and work is being conducted in three continuous shifts. Two concrete mixing plants have been erected and the tunnel is being lined as rapidly as it is driven. While active construction work was not begun until December, 1905, the contractor expects to complete the three miles and a half of tunnel by February 1, 1907, and present progress indicates his ability to do so.

Bids for the Garland canal, which is an extension of the Corbett tunnel, were opened several weeks ago, and advertisement will be made at once for the structures along this canal. The engineers are now making final location for the lateral distribution system to cover the first 30,000 acres, the line being situated in the vicinity of Garland. In locating the main canal an opportunity for providing domestic water supply for the towns likely to spring up along the line of railroad has been found. Provisions will be made whereby an abundant supply of domestic water can be had at a nominal expense whenever the requirements exist.


## Progress of Government Irrigation Work During Past Month

**Umatilla Project Authorized**

The Secretary of the Interior has authorized the Reclamation Service to proceed at once with the work of construction on the Umatilla irrigation project, Oregon, for which the sum of $1,000,000 was set aside from the reclamation fund by the department on December 4, 1905.

The Umatilla project embraces 20,000 acres immediately south of Columbia River, and east of Umatilla River. The engineering work in connection with this project consists of a feed canal from Umatilla River to the Cold Springs reservoir, and a distribution system. The works are of simple character and capable of being constructed in a short time. The irrigable area under this project lies below 500 feet in altitude, is rolling in character, and the lands are of high fertility. The climate is warm and the soil adapted to orchards, small fruit and vegetables. Transportation facilities are excellent, the lands being within 200 miles of Portland, Ore., or Spokane, Wash., on the main lines of the Oregon Railroad and Navigation Company.

**For Private Enterprise**

After a careful investigation of conditions connected with the Lake DeSmet project, Wyoming, it has developed that the conditions are more favorable for irrigation by private enterprise than by the Government. The Secretary of the Interior, therefore, has restored to settlement a tract of land which was temporarily withdrawn in connection with this project, such land not to be subject to entry, filing, or selection, however, under the public land laws until ninety days after notice by such publication as may be prescribed by the department. The tract thus restored consists of the public lands within an area of about 400,000 acres.

**Losing Engineers**

The inauguration of many large engineering works at this time, such as the National reclamation projects, the Panama canal, and the New York barge canal, and the unusual amount of railroad building has so stimulated the demand for engineers that it is found difficult to hold good men at the salaries the Reclamation Service is now paying.

About forty engineers of various grades have resigned from this bureau in the past year, and a similar number have requested furloughs, nearly all of these being on account of railroad or other organizations. The emoluments of a Government position are seldom commensurate with the value of the services rendered by the engineering profession, and but for the magnitude of the works projected by the Government and the opportunities offered to obtain distinction in their construction, few engineers of ability would seek these positions.

The regulations do not permit the engineers to accept outside work, even in an advisory capacity, a privilege which is not denied other members of the profession, and from which they

are able to add materially to their salaries. In the matter of subsistence and other expenses the Government is not as liberal as other employers, and it is not to be wondered at that Uncle Sam is losing a large number of skilled and experienced men whose services are greatly needed. The gravity of the situation is appreciated, and is giving the department much concern.

**Decision on Residence**

The Secretary of the Interior has received a request for an opinion as to whether a citizen of the United States, whose duties compel him to reside temporarily in Washington during the session of Congress, is entitled to purchase lands within the limits of a reclamation project from present owners and obtain the benefits of the Reclamation Act, providing he complies so far as his duties will permit with the rules and regulations as prescribed.

The Assistant Attorney General states that the question of residence is usually a mixed question of law and fact, and it would be impracticable to attempt to formulate a general rule to govern all cases; each must be determined upon the peculiar facts. Temporary absences do not necessarily terminate a residence once established. If the citizen shall establish in good faith a residence upon the land or in the neighborhood of the tract, and shall maintain such residence in accordance with the true intent of the law, his temporary absence would not disqualify him from receiving and holding a water right. His right would have to be determined by the facts as they develop in the future.

**Co-operative Work**

The Reclamation service is coöperating heatily with the Bureau of Plant Industry in a series of experiments which the latter is initiating in the vicinity of Yuma, Ariz. A plot of ground controlled by the service has been turned over to the plant experts who propose to experiment with cotton and other crops.

The delta of the Colorado River has always possessed a singular fascination for the scientific men of the Department of Agriculture, and the results of these experiments cannot fail to prove of inestimable value to the settlers, who will take up homes in this region as soon as the Government's irrigation works are completed.

It is a demonstrable fact that no other portion of the United States, when irrigated, is capable of supporting a denser population than the Colorado delta. Five acres properly cultivated and irrigated will support a family in comfort as the crop season is practically continuous. One crop follows another throughout the year. Oranges, pomelos, melons, all the small fruits and vegetables mature earlier here than in California, and consequently are marketable at the top prices.

In connection with the coöperative work between the United States Reclamation Service and the Department of Agriculture, Prof. F. C. Miller, of the Forest Service, will at once begin a study of the tree planting possibilities in the North Flatte irrigation project.

In coöperation with the work of the Reclamation Service on the Truckee-Carson irrigation project, Nevada, the Bureau of Forestry will begin at once a thorough study of the tree planting possibilities in that project. The work will be directed by Mr. E. O. Bierke.

**Southern Stream Gaging**

Mississippi and eastern Louisiana are about to receive the attention of the Geological Survey. In response to numerous requests from many parts of this drainage area the Hydrographic Branch will establish at once a number of river stations for the purpose of collecting data in connection with the development of water power and the irrigation of truck farms.

Mr. W. E. Hall, a representative of the Hydrographic Branch, has recently made reconnaissances to locate suitable points for obtaining reliable data concerning the flow of several streams

in this section. As a result of these reconnaissances, gaging stations will be established at once on Tallahatchie River near Batesville, on Yalobusha River near Grenada in northern Mississippi, on Homochitto River near Rosetta in southwestern Mississippi, and on Tangipahoa River near Amite and on Bogue Chitto near Warnerton in eastern Louisiana. The establishment of additional stations will depend upon the finding of suitable points and upon the availibility of funds to carry on the work.

Mr. M. R. Hall, hydrographer in charge of the stream gaging work in the Southern States, has spent years in the study of the behavior of southern rivers. His supervision of this work insures a careful collection of reliable data.

The demands upon the survey for the results of its investigation in other sections, and for the initiation of similar work elsewhere have increased enormously in recent years. These requests by their scope indicate a proper appreciation of the value of the work of the survey and furnish proof of the need of its continuance and extension. They are not only from those interested in large enterprises looking to the utilization of water power, but from the municipalities along the streams, whose growth has made the question of water supply a paramount one, and from districts in which truck farming has become a prominent industry.

The publication of the results of the hydrographic investigations has been followed quickly by the installation of power plants on streams, the discharge of which has been found by the survey to be ample. Many notable cases might be cited in this connection as illustrating the importance and economic value of the data obtained by the hydrographers. Working either in coöperation with State governments or alone, the Survey has surveyed and mapped hundreds of rivers, and for a term of years has kept accurate records of their fluctuations and flow This work in a large measure has been responsible for the progress in the East and South of the manufacturing interests.

**Personals**

Mr. Luke C. Robertson, of Austin, Texas, has received an appointment as assistant engineer in the Reclamation Service, and directed to report at Montrose, Colo., for duty in connection with the Uncompahgre project. Mr. Roberston graduated at the University of Texas, and took an additional three years' course in the engineering department of that institution, holding the position of student assistant during a portion of the time. He has recently been engaged with the Houston and Texas Central Railroad.

Mr. Hugh T. Caldwell, of California, has received an appointment as stenographer in the Reclamation Service by transfer from the Postoffice Department, and has been assigned to duty at Huntley, Mont., in connection with the Huntley irrigation project.

Mr. John B. Stobo, of Greensboro, N. C., has received an appointment in the Reclamation Service as assistant engineer, and directed to report at Great Falls, Mont., for duty in connection with the Sun River project. Mr. Stobo was formerly employed by the Erie Railroad as transit man, and also by the Southern Railway Company designing concrete steel arch bridges.

Mr. Robert E. Horton, for several years in charge of hydrography in the Eastern part of the United States with headquarters at Utica, N. Y., will sever his connection with the United States Geological Survey on June 1, in order to study special hydraulic problems connected with the New York barge canal.

Mr. Earle K. Knight, of Redmond, Ore., has been appointed assistant engineer in the Reclamation Service, and assigned to duty on the Huntley project, Montana. Mr. Knight graduated at the University of Michigan in 1903,

having taken a full course in civil engineering. His experience consists of surveying, mapping, and computing, designing, and constructing headgates, flumes, and lateral intakes, location of main canals and laterals, topographic surveying, and performing the duties of assistant engineer on construction.

Mr. R. M. Packard, of Ithaca, N. Y., has been directed to report to Engineer R. S. Stockton, Huntley, Mont., for duty in connection with the Huntley irrigation project. Mr. Packard, who is a student at Cornell University, has had experience in hydrographic work for the United States Geological Survey.

Mr. John C. Holmes, of Omaha, Neb., has received an appointment as assistant engineer in the United States Reclamation Service and assigned to duty on the Huntley project, Montana. Mr. Holmes took the degree of C. E. at the University of Nebraska, and has had experience in various capacities in surveying, and designing tile drain systems. He is now engaged as structural engineer by the Des Moines Bridge and Iron Works, Des Moines, Iowa.

# PUMPING WATER

## Third Paper

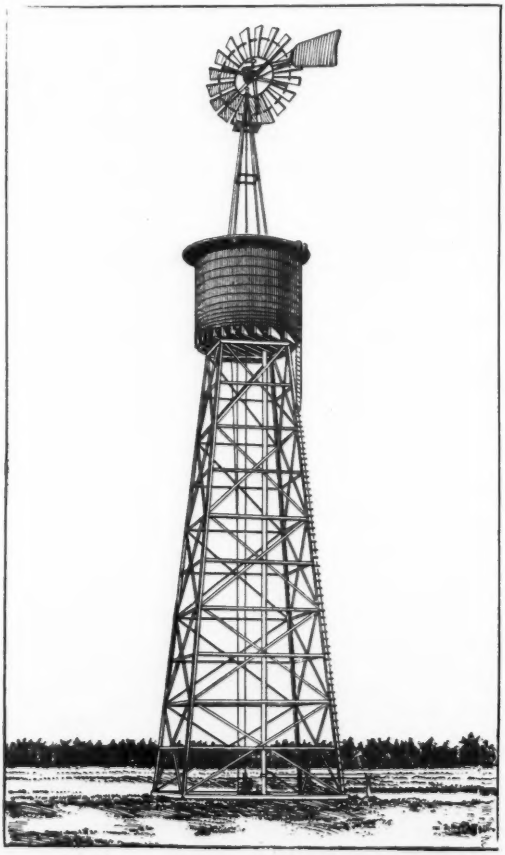
The arrangement of windmills for pumping water for irrigation is illustrated in the drawing accompanying, which gives a view of an earth reservoir built nearly circular in form. The two windmills, which supply the water, are placed upon opposite sides, in order that the pumps may be as far apart as possible. In many instances three of even four mills, each of moderate size, are placed around a reservoir of considerable size. The banks, made of earth, are covered with sod to protect them from washing by the rain and by the waves during times of high winds.

The drawing of the steel windmill and tower carrying a tank represents an adaptation of a windmill for use in domestic water supply or for furnishing water to a village or small town under considerable pressure. The wind engine is erected on the top of a high steel tower, which also supports a wooden tank with suitable cover to protect the water from loss by evaporation. This device is generally employed by railroad companies at stations on the great plains, where the wind may be depended upon to force a sufficient supply into the tank for use by locomotives or for the railroad shops and offices. Many towns also depend for their water supply for domestic needs and for watering gardens upon a windmill pumping water into an elevated tank, particularly where the general surface is so nearly level that it is impossible to construct a small earth reservoir within reasonable distance of the pricipal buildings.

The home-made mill, or Jumbo wind engine, has been employed to a considerable extent in the Great Plains region, and is usually constructed by the owners. The merit of the device is its cheapness. It may be built mainly of old lumber and other material that can often be found about the farm, such as axles or other gear from old farm machinery, bale wire for staying the sails, and pieces of wood or metal which may be classed as old junk. The machine cannot be recommended on the ground of efficiency or economy. If a farmer has sufficient capital to purchase and erect a good windmill, he will undoubtedly succeed better than by spending his time in making the cheaper device. On the

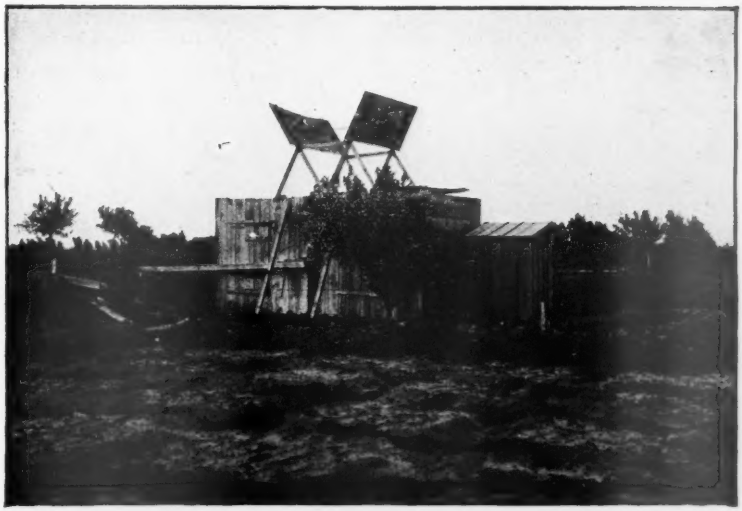
other hand, in situations where, as is often the case in a dry region, the farmer has lost crops year after year, has exhausted his resources, and is on the verge of bankruptcy, a contrivance of this kind may serve to save a small crop and give him a new start. In such instances there usually will be found pieces of broken-down machinery about the farm. Time and labor are commonly of little value where the ordinary farming operations have been unsuccessful, so that by the exercise of a little ingenuity the material and energy that otherwise would be wasted may be turned to advantage.

The mill or engine consists of a shaft of wood or iron placed horizontally and supported at each end. Upon this sails are fastened by arms extending out at right angles. On each end of the shaft is attached a crank, and each of these cranks in turn drives some simple form of home-made pump. The lower half of the mill is boxed in, and thus forms a small building without roof, above which project the arms carrying the sails.



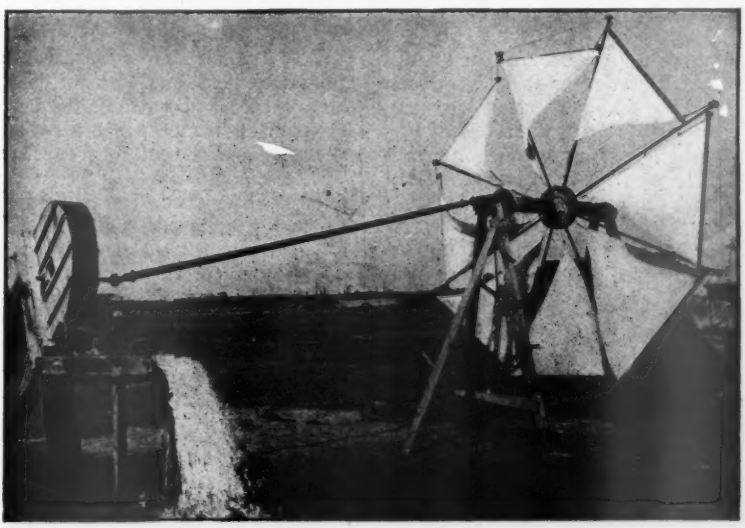
**Steel Windmill and Tower Carrying Tank.**

Another home-made device has been introduced. This mill and water elevator, invented by the owner, has been successfully used to furnish wa-



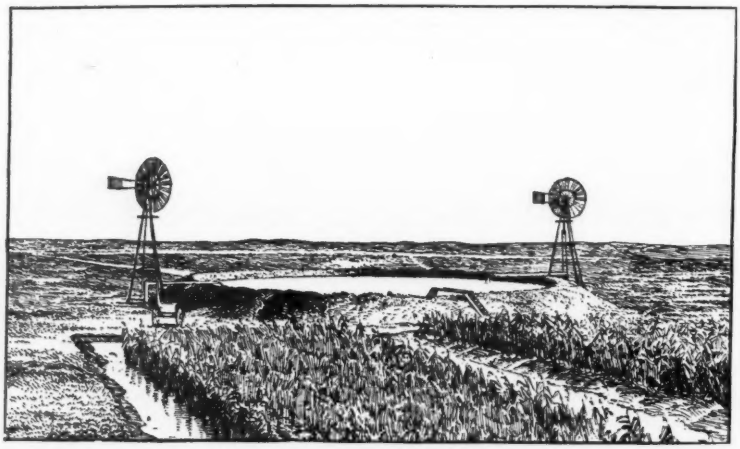
**Home-made Wind Engine as Used on Great plains.**

ter for irrigation; and, although not by any means an economical device, nor one that can be recommended, it has served its purpose. In other words, while, as a rule, it is economical to purchase the best, there are circumstances and times when for special reasons the best mill cannot be had; but it is still practicable to construct a machine which will accomplish the desired end, that of getting water from the ground upon the land.



**Defender Windmill and Water Elevator.**

These examples of inventive genius on the farms of the West might be almost indefinitely multiplied, but are sufficient to demonstrate the principle that with energy and ingenuity a start toward irrigation can be made. When, however, some experience has been had in irrigation and newer mills are being produced, it is highly essential for continued success that something gator. Thousands of windmills are in use and thousands more will be purchased, involving expenditures on the part of farmers aggregating millions of dollars. A saving of even a small percentage in cost of repairs is a matter of considerable importance to the irrigators of the country in the continued use of the water.



**Windmills and Circular Reservoir.**

better than the ordinary form of mill be obtained. Many of these have been designed for some other purpose than that of raising large quantities of water through a short distance for irrigation. Some, for example, have been built with the idea of pumping a small quantity from great depth for watering stock. Such mills, as a rule, do not fill the requirements of the irri-

If a farmer is able to buy a windmill and pump he should get the best, as the first cost is about the same for different makes; but the economy of repairs is far different. In subsequent articles the attempt will be made to give the experience of practical irrigators in using various styles of machinery, pointing out the benefits of each other under certain conditions.


## History of Past Month in Government Forest Work

**Planting on Watersheds**

A variety of causes are awakening an interest in forest planting on lands owned primarily for some other purpose than the use of timber but capable of yielding an added revenue from crops of trees. Coal and railroad companies and other large landowners, including water companies, are taking active steps to utilize waste lands in this way. The fact that local supplies of railroad ties, mine timbers, and lumber are shrinking, coupled with the realization that the needed timber can well be produced on soil now unproductive, has made forcible appeals to the business mind. In Pennsylvania, especially, large forest plantations are actually under way.

There are enormous areas in Pennsylvania from which the original timber has been cut, and which are too rough for profitable farming. In the coal regions both the farm lands and the mountainous areas overlying the coal veins are usually held by the operating companies in order that they may obtain full rights to the coal underneath. Much of the land overlying the coal is useless for farming at any time, and it has been found that there is little profit to be derived from the agricultural land by any system of tenant or company farming. Both these classes of land may be planted to trees with advantage and the timber used in the mines, the old fields on which farming has been attempted being particularly desirable for planting. In the bituminous coal fields it is necessary to select the planting sites with great care so as to avoid the sulphur fumes from coke ovens, which are very destructive to vegetation. Watersheds owned to prevent further denudation and the contamination of streams and reservoirs rarely yield direct returns to water companies, but if properly planted their water-conserving power would be increased, and at the same time future revenue would be in prospect. Waste lands in general throughout the State can be improved and made productive wholly or in part by forest planting.

The possibilities of forest planting have been realized by several large companies, which have applied to the Forest Service for assistance. The Service has made planting plans for the H. C. Frick Coke Company and the Keystone Coal and Iron Company, in western Pennsylvania, and is supervising planting and the establishment of forest nurseries this spring. The Pennsylvania Railroad Company has secured the assistance of the Service in working up a forest policy, and, in order to show what can be done on the lands they already own, a nursery is being started and planting begun along the right of way and also on an important watershed near Altoona, Pa. The Johnstown Water Company is receiving similar assistance. In eastern Pennsylvania the Lehigh Coal and Navigation Company has applied for an examination of a 36,000-acre tract of the Monroe Water Supply Company, in Monroe County, and the preliminary examination is under way.

Planting is feasible on most of these lands, the greatest difficulty being to keep out fire. Chestnut, red oak, hickory, bassword, white, red, and Scotch pine, and European larch are suitable species, the selection depending on the character of the land and the kind of timber desired.

By the plan of Government cooperation a technical forester can be sent without charge to make a preliminary examination of lands on which planting is contemplated. This determines whether planting is advisable. If the preliminary report is favorable, a detailed plan for planting and nursey work can be made at a cost to the owner of the actual expenses of the work. Supervision can also be provided under special arrangement.

**Fire Fighting on Forest Reserves**

The worst enemy of the forests is fire. To combat it the Forest Service maintains a fire-fighting system. How effective is this system is shown by the following figures for the last two years:

| Year ending— | Area in Acres. | | Per cent of reserve area burned |
|---|---|---|---|
| | Of reserves. | Burned over. | |
| January 1, 1905 | 58,052,054 | 388,872 | 0.66 |
| January 1, 1906 | 92,741,030 | 152,557 | 0.16 |

*Area of forest reserves in the United States, exclusive of Alaska and Porto Rico.*

In other words, while the reserve area has almost doubled, the burned area has been reduced by more than one-half, and the percentage of area burned has been reduced by more than three-fourths.

Only since February 1, 1905, have the reserves been under the administration of the Forest Service. This reduction is therefore the showing of the first eleven months of administration by Government foresters. The working out of a system of effective control of fire on the reserves is still in its infancy. "Too much fire" is still the judgment of the Forester on the situation. Of course, bad seasons play a large part in determining the fire losses of a year. Even with the best possible system of protection there are bound to be wide fluctuations between individual years. But it is believed that under expert care the injury to the National forests can be rapidly and permanently cut down.

In developing its system of protection the Forest Service availed itself of past experience, home and foreign. The reserve officers—forest guards, assistant forest rangers, deputy forest rangers, forest rangers, deputy forest supervisors, and forest supervisors—are under the direct supervision of the office of the Service at Washington, guided by a definite code of instructions; but large authority, with corresponding responsibility, is placed upon the local officers themselves. All except the forest guards are civil-service employees, and the salaries paid range from $720 to $2,500 a year. Each supervisor is responsible for the patrol of his reserve and is expected to devise systems best suited to his locality. Already, in the brief period since the organization of this system, a high standard of efficiency has been developed, and a much higher is expected.

A constant lookout for fires is kept from ridge trails and commanding points during the danger season, and the reserves are patrolled as efficiently as possible with the force available. Roads, trails, and fire lines are constructed, affording means of rapid communication and points of vantage at which to arrest the progress of a fire, and telephone lines are being run to help give warning and summon assistance.

Every forest supervisor is authorized, in person or through a subordinate, to hire temporary men, purchase material and supplies, and pay for their transportation from place to place to extinguish a fire. When the cost is likely to exceed $300 the supervisor telegraphs the Forester for authority to incur the additional expense.

Forest rangers are required to report monthly to the supervisor regarding all fires occurring in their districts.

These reports cover the location, damage done, probable cause, by whom the fire was discovered, when discovered, when brought to the notice of the forest officer, when the work of fighting the fire was begun and finished, how many extra men were employed, and cost of fire. At the end of the year the supervisor submits an annual fire report to the Washington office.

During the calendar year of 1905, 36 of the 93 reserves escaped fires altogether. On the remaining 57, areas were burned over ranging from 1 to 79,083 acres (Northern Division of the Sierra Reserve) and amounting to 279,592 acres. The largest amount of timber was destroyed on the Lewis and Clark Reserve (Southern Division)—42,893,000 board feet. The total for all reserves was 152,557,000 board feet, with a value of $101,282, but the greatest loss in money value was $27,320 on the Priest River Reserve. The total cost of extra labor and supplies for fire fighting was $12,573.52.

General cooperation of all coming in contact with the forests is earnestly to be sought, first, to guard sedulously against the starting of fires, and, second, to aid in every way in extinguishing such as occur.

In this connection may be mentioned several steps already taken toward cooperation among the Forest Service, the State governments, and local interests in fighting fires.

In California, the Forest Service, the State forester, and the lumber companies are cooperating to prevent and nght fires, all forest rangers having been made State fire wardens. In Oregon and Washington the Forest Service is cooperating with the timber companies to the same end. The Governor of Idaho is inaugurating a movement to organize the timber companies of that State to cooperate with each other and with the State in fighting fires, and has asked the assistance of the Forester, who has replied that the Service will aid the movement by furnishing plans and assisting in carrying out any measures agreed upon by the Idaho organization.

**Cross Ties in 1905**

Probably no product of the forest has been the subject of more discussion and diversity of opinion than the annual consumption of cross-ties in the United States.

The following statements are made possible by the almost unanimous cooperation of the steam railroads with the Forest Service in furnishing the necessary data. While these statements are nearly complete for the purchases of cross-ties by steam transportation companies, they are below the total number of cross-ties used, since no reports from electric lines are included. The figures given are based upon reports from 750 companies, having an aggregate trackage of 278,262 miles. Since, according to Poor's Manual for 1905, the total trackage of the railroads in the United States is 293,937 miles, it follows that the mileage reported is 95 per cent. of the total. Switch ties have been figured into the equivalent number of cross-ties.

The total number of ties reported is 80,051,000, of which 22,569,000, or 36 per cent., were to be used for the construction of new track.

On this basis the total number of ties used by the steam railways would be 84,400,000, representing nearly 3,000,000,000 feet of lumber, board measure.

Preservative treatment was given to 7,615,000 ties, representing nearly 10 per cent. of the total number reported. Although the species of timber treated have not been separated in most cases, it is safe to say that almost all of the ties treated were softwoods.

**Control of Grazing on Public Lands**

Now that the Government grazing policy is in successful operation on the National forest reserves, the question has arisen whether the same or some similar policy might not be applied to the open public range.

The policy of the Forest Service is not ot hold the reserves out of use, but to secure their fullest and most permanent use. To this end, grazing under proper restrictions is permitted.

Happily, these restrictions have thus far met with general approval.

From the first, the importance of fitting the regulations to local conditions has been recognized. Rules occasioning needless hardship to stockmen have been modified, and emergencies demanding instant action have been promptly met.

When a new reserve has been proclaimed all stock grazing upon it is allowed to remain during the first year; if, afterwards, this number is found to be too great for the resources of the range, it is gradually reduced. Stockmen are aided in effecting a satisfactory distribution of their stock upon the range and in securing from it the most profitable and permanent use. Small stock owners living in the vicinity of the reserves are given such preference in the allotment of grazing privileges as will protect their interests. First occupants of the range and farmers owning improved lands adjacent are also preferred. The rights of large owners based upon the range custom of the past are recognizd, and reductions in the number of their stock are required only when necessary to protect the range or the grazing rights of bona fide settlers.

Necessary range divisions between owners of different kinds of stock are made, and controversy between sheepmen and cattlemen is promptly ended. Where necessary, the construction of drift or division fences is also allowed, provided the area fenced is not greater than the needs of the stock owner.

Outside the forest reserves, however, is an area of public land, estimated at 400,000,000 acres, which has no present value except for grazing purposes. On this land grazing is wholly unrestrained by law. Commercial interests, great and small, have competed for its use, and the result has been abuse of the range. Millions of acres have been recklessly overgrazed and practically ruined. In his last annual message the President says: "It is probable that the present grazing value of the open public range is scarcely more than half what it once was or what it might easily be again under careful regulation." Some stockmen have, to the exclusion of others, possessed themselves of the strategic positions—that is, the lands controlling the streams, springs, and other watering places, and by this means have secured temporary control of the adjoining grazing lands. Charges of fraudulent entry have led to litigation. Great areas have been illegally fenced. Again, stock owners, notably sheep and cattlemen, have defended their conflicting claims by force of arms, causing serious loss of property and even of life.

Obviously such conditions should be corrected by law. The remedy would seem to be to apply to the open public range the regulations already governing the forest reserves. This conclusion is strengthened not only by the success attending the forest-reserves policy, but also by the effect of fencing the public grazing lands. Though illegal, this fencing has in most cases greatly improved the condition of the area inclosed. Care, however, must be taken to avoid the application of sweeping and ironclad regulations to an area so vast and to conditions so different. The investigations of the Public Lands Commission show that immediate application of any inflexible rule to all grazing lands alike, regardless of local conditions or grazing values, would be disastrous, and that improvement must be sought through the gradual introduction into each locality of such form of control as is specifically suited to it.

In his message, already referred to, the President says:

"The best use of the public grazing lands requires the careful examination and classification of these lands in order to give each settler land enough to support his family and no more. While this work is being done, and until the lands are settled, the Government should take control of the open range, under reasonable regulations suited to local needs, following the general policy already in successful operation on the forest reserves."

Should the policy thus suggested be established by law great good would undoubtedly result.

# STATE FORESTER FOR MARYLAND

THE appointment of Mr. Fred W. Besley as State forester of Maryland is a good one, and is a deserved recognition of a young man whose love for the profession induced him five years ago to give up a position in which he was receiving a good salary in order to secure a thorough training in forestry.

Mr. Besley was born in Virginia, and graduated from the Maryland Agricultural College, with which in his new position he will be closely identified, the law providing for a course of lectures there each year by the State forester. The first two winters in the Forest Service he spent in the office, where he became thoroughly acquainted with methods of calculating forest measurements. In the summer of 1901 he was a member of a party which made a forest survey of Townships 5, 6, and 41, in the Adirondacks. The following summer he assisted in commercial-tree studies in Kentucky, and for a short time in the fall was engaged with others on a working plan for forest lands of the Kirby Lumber Company, in eastern Texas. Later in the fall he entered the Yale Forest School, from which he graduated in June, 1904. In September of that year he temporarily relieved Mr. Charles A. Scott, who wished to complete his course at Yale, taking charge for nine months of the forest nursery and tree planting on the Dismal River Forest Reserve, at Halsey, Neb. His work was so satisfactory that he was immediately put in charge of planting operations on the Pikes Peak Reserve, establishing nurseries at Clyde and Bear Creek, and planting a considerable area with trees shipped from Halsey. Later, his studies were enlarged to include lecture work in Colorado. In accepting his new duties on July 1, he will still retain a connection with the Forest Service as collaborator, continuing the coöperative forest work of the Government with the State of Maryland.

This office, created by the new Maryland forest law, brings rare opportunities and also heavy responsibilities. The variety in soil, climatic conditions, and topography, and the peculiar situation of the State where the northern forest and southern forest meet, furnish an unusually large number of tree species, and the problems of handling lands now forested and planting those which should be, present problems which will require the most careful application and special adaptation of the principles of forestry. For this the soundest knowledge of the subject is essential, and here Mr. Besley's wide experience with trees from the seed to the saw will stand him in excellent stead. His ability to interest the public in forest matters is also an important qualification, since the success of the new law depends largely upon the extent to which the services of the forester are utilized by the lumbermen, timberland owners, and especially the farmers, in the management of their woodlots.

Although the State of Maryland has soil and climate admirably adapted for forest growth, in many situations being better suited for them than for annual crops, forest lands are not now paying their owners as well as they should. Indeed, considerable areas, capable of producing the best timber, are occupied by an inferior forest growth, or, having lost much of their fertility in growing tobacco and other soil-exhausting crops, are now scarcely utilized at all. In buying Maryland forest land at present prices and handling it under the expert advice which is now available, the far-sighted man will make a profitable investment. Length of growing season, suitable moisture conditions, nearby markets and excellent transportation facilities would all contribute to the success of

forestry in Maryland. The Secretary of Agriculture spoke first of all of the possibilities in the production of timber in his address at the golden anniversary of the Maryland Agricultural College, when he advised every young man to immediately buy a Maryland farm and settle on it.

The forming of a State forest reserve has begun auspiciously in the acceptance of a gift from Mr. Robert Garrett of 4,000 acres in Garrett County.

Without detracting from the credit due State Senator Brown for the introduction and passage of this excellent law and the concern he is taking in its successful operation, it is interesting to note that in Maryland as in Wisconsin, Massachusetts, Connecticut, California, the enactment of a State forest law and the appointment of a trained forester follow the cooperative work of the Government. In coöperation with the State Geological Survey, the Forest Service has been conducting investigations in Maryland since 1900. In that year, Mr. George B. Sudworth made a forest survey of Allegany County, which was published in a State report upon that county. Under Mr. Sudworth's direction similar surveys were made of Cecil, Garrett, and Calvert counties from 1901 to 1903, by Mr. H. M. Curran, the first two of which have also been published by the State. Similarly, in 1903, a study of forest conditions in Worcester County was made by the late William F. Hubbard, and, during recent months, field work has been conducted by Mr. C. D. Mell for a forest description of St. Mary and Harford counties.

In addition to the coöperative work, a study of the basket willow industry was made by Mr. Hubbard in Howard and Baltimore counties, and a commercial-tree study of chestnut in Anne Arundel, Calvert, Charles, and Prince George counties by Mr. Raphael Zon, the results of which were published in Bulletins 46 and 53, respectively, of the Forest Service. In connection with Mr. Hubbard's general forest description of Worcester County, he conducted a commercial investigation of loblolly pine—an exceedingly important timber tree in that county for short rotations for box lumber.

In 1905, Mr. Curran made another field study of forest lands in Garrett County, including the tract which has become the nucleus of the State reserve, preparing maps and suggestions for their management.

During the summer of 1905, Mr. William D. Sterrett with a party made a study of scrub pine in Maryland, and Mr. George H. Myers established a number of permanent sample plots for the purpose of carrying on systematic experiments as to the effect of thinnings upon forest growth, for loblolly pine in Worcester County, and for scrub pine at Bowie. Mr. W. W. Ashe made a study of the Potomac River watershed also during the last field season to determine the character of the forest and its relation to the water supply.

# WEST VIRGINIA FAVORS RESERVES

## The Governor of That Commonwealth Argues Strongly for Prompt Action

WEST VIRGINIA'S interest in the eastern forest reserve question is shown in the following letter:

June 5, 1906.

HON. JAMES WILSON,
President of the American Forestry Association,
Washington, D. C.

Dear Sir: I am in favor of the proposed establishment of the Appalachian Forest Reserve and the White Mountain Forest Reserve:

(a) The teachings of history gleaned from all civilized nations demand that forests should be preserved, that the balance of nature be not disturbed, thus fatally affecting sound economic conditions. Even Russia, since 1888, has had an Imperial Forest Policy. Japan has a reserve of twenty-nine million acres under a finely organized

**HON. WILLIAM M. O. DAWSON**

**The able and aggressive Governor of West Virginia who favors the establishment of Forest Reserves in the Southern Appalachians and the White Mountains.**

system. The Appalachian system is now the best hard-wood producing region in the Union, possibly in the world. It can furnish cottages and palaces for the nations. The active spread of railroads is carrying destruction into the heart of these forests, and all the growth, from sapling to trees of mature age, without respect to "color, age or previous condition" are cut. At the present rate of destruction, without means of reproduction, the price of timber for commerce will soon be prohibitive.

(b) In all mountain countries a destruction of the forest has been a destruction of the country. "After the timber the flood." The soil hardens like a slate roof and the water runs off. It is the amount of water which enters the soil, not the precipitation, which makes a region a garden or a desert. The soil is destroyed, the streams dwindle to nothing or at times are irresistible torrents, spreading devastation and terror along their courses. The land under consideration is said to be valuable as forest lands only. It lies at the sources of interstate rivers and its preservation as a forest region is of untold and inestimable value to the countries below.

(c) In a denuded country the streams are yellow, the soil carried to the sea, navigation impeded thereby, water power imperilled, food fish and other aquatic life killed, and scenic beauty destroyed.

The above applies not only to this State, but with equal force to the other States concerned. Nearly every Governor's message of recent years has directed attention to this important matter; and our recent Tax Commission, an able body, went beyond its legitimate scope to urge attention to it.

Respectfully,
WM. M. O. DAWSON,
Governor of West Virginia.

# SPRING FIELD WORK OF THE SENIOR CLASS OF THE YALE FOREST SCHOOL

BY

HERMAN H. CHAPMAN

THE senior class of the Yale Forest School, seventeen in number, spent the spring term at Waterville, N. H., upon the tract of 22,000 acres owned by the International Paper Co. This valley contains one of the largest bodies of virgin spruce remaining in New Hampshire. The slopes of the surrounding mountains are still covered with dense stands of timber, although most of the lower slopes have been logged.

The conditions are ideal for training in the practice of map making, and timber cruising and along these lines the work was organized. The School was fortunate in securing Mr. Henry Gannett, Chief Topographer of the U. S. Geological Survey, to direct the construction of a topographical map of the Waterville valley. A scale of 2,000 feet to 1 inch was used, with contour lines at 100 feet intervals. Primary points were located from a base line with the plane table, and transverses run along roads, streams and trails, using steel tapes and aneroids. From the data thus obtained the contours were sketched in. Each man completed this portion of the work independently.

Practice in estimating was taken up systematically upon a tract of 40 acres on which all the spruce were first cal-

ipered and their contents calculated from an existing volume table. One tract was then estimated by taking circular quarter acre plots at regular intervals so as to obtain 1-10 of the area. The results so obtained, using the same volume table showed a conservative estimate, running with some crews 20 per cent. lower than the actual stand.

The second method was the selection of a sample acre, the contents of which was multiplied by 40 to get the total stand. This method universally overran the actual stand, in some cases going 40 per cent. too high.

The class then took up the estimation of the log contents of trees. Strips were run 4 rods wide in compass courses. The diameters were estimated by the eye and recorded by dots and in parallel columns, the upper diameter of each log, and total number of logs in each tree. The contents of the logs were calculated by the Scribner rule to obtain the stand per acre. By this method, and having a tract whose total stand was known, as a basis, the men rapidly acquired the ability to accurately estimate timber and became familiar with log sizes, number of logs per tree, number per thousand feet scaled and the taper of the timber. The slender rapidly tapering timber of upper slopes was estimated by this method as easily as the taller timber below, and the only checks found necessary were the occasional measurements of a fallen tree for merchantable length and taper.

The whole tract of 22,000 acres minus the cut-over land was then estimated by this method, the work occupying about 10 days for 17 men. While running the strips, distances were obtained wholly by pacing, the total distance of each line being scaled off the map to serve as a check, especially on steep slopes. The cut-over areas, and types were mapped at the same time, and notes taken on the character of the timber, reproduction and possibilities of logging.

During the final week this data was summed up and a working plan was made for the tract, comprising a plan for fire protection, lumbering and administration with the object to maintain the spruce forests on all areas suitable for its growth and secure as large a return as possible in the future at minimum cost.

The class will go out well equipped for similar work on the Government reserves or for private parties.

# THE MANTI FOREST RESERVE

## Description of a Typical Reservation in Utah

BY

A. W. JENSEN
Forest Supervisor.

THE Manti Forest Reserve, Utah, was established by proclamation of the president of the United States. Theodore Roosevelt, on the 29th day of May, 1903, and embraces an area of ,584,640 acres.

This reserve is located between the 111 and 112 degrees west longitude, and the 39 and 40 degrees of north latitude, and within townships thirteen to twenty-one south, and ranges two to eight east, S. L. Mer., embracing valuable grazing, timber, mining, and watershed lands of the Wasatch Plateau. Immediately at the foot of the reserve and upon its western side the valuable lands of San Pete County, and upon the eastern side the valuable farming lands of Emery County.

The elevation of the reserve varies from 5,500 to 11,000 feet and from its summit or dividing watershed line which extends through the entire reserve at an angle of south 18 degrees West, arise canyons which traverse the reserve from two to twenty miles and

enter the valleys below. Through these canyons flow the waters which come from the melting snow to the valley where it is used for irrigation.

On the eastern slope immense, precipitous ledges of rock, in many places hundreds of feet high have been exposed and yet left intact by the erosion of centuries, while on the western slope the grade is gradual toward the base of the mountain sides.

Upon the higher elevation of the reserve, especially within 8,000 feet to 11,000 feet, falls, during the winter season, from November until March or April, great quantities of snow which melts during the months of May, June, and July and furnishes life to the mountain springs and streams. The water from this snow is used by the farmers for the irrigation of lands producing wheat, oats, barley, rye, corn, potatoes, beets, and alfalfa. The snow is piled and packed by the winds upon the north slopes of the canyons within the reserve and particularly at the altitude heretofore mentioned.

The approximate acreage of irrigated lands is 55,000, and upon such a small main watershed, have been grazed during the months of July and August, each year for ten years preceding the year 1904, approximately 300,000 sheep.

This grazing was in excess to the producing power of the lands, and for each year for ten years past, and preceding the year 1904, the watershed was being made a desert waste.

The rains falling upon the denuded and over-grazed lands became torrential floods which swept their way into the hamlets and towns situated in the valleys below, and carried with them immense quantities of rock and debris.

Creek beds were changed and cut deep into the mountains, the laterals taking water to the farmers' lands were destroyed, and the work of man in many places swept away.

These floods, each one in its turn increased the taxes of the people, until the town of Manti decided that relief must be found. Manti turned its face toward the Government of the United States for help, and succeeded in securing it. The Government said the Manti city watershed must be protected from devastation by stock. The policy announced was set in active operation, the vegetation began once again to come forth upon denuded areas, the rains falling upon the protected canyon area was to a marked degree held back in the mountains, the floods began to grow less, and the taxes of Manti City for years levied and collected to combat the floods were reduced, and in the year 1904 it was almost unanimously conceded that the Government had solved the vexatious question and restored a new hope and life to the troubled town.

The people of other towns, both of San Pete and Emery Counties quickly noted the effect. This moved them to turn to the Government for the same class of protection. Therefore, President Roosevelt expressed the majority voice of the people of San Pete and Emery Counties, Utah, when he established the Manti Forest Reserve, and since the date of the establishment of this reserve the people's petitions have been further answered by the proper Department in making rules of protection against overstocking the main watershed.

During the year 1904, the first year of Government management of grazing upon the reserve, it was almost universally conceded that upon seventeen creeks originating within the reserve and carrying the water supply for irrigation of lands in San Pete and Emery Counties, the work of the Department wrought great benefit in maintaining a continued and improved water supply.

Within the eastern part of the reserve are immense coal deposits, and in many of the canyons veins of coal varying in thickness from 6 to 12 feet appear upon the surface. The coal deposits can be traced without fault for a distance of over 35 miles, and at coal mines in several places the neighboring residents of the reserve can be seen, during the fall season, to drive into the mine with teams unhitched,

load the wagons and drive out of the mine.

Much coal have heretofore been removed from the reserve lands, and it is expected that the establishment of the reserve will aid in such a manner as to have these lands only conveyed to private parties pursuant to the Federal law.

It appears from the records made by the Department within the last two years that the Manti Forest Reserve has fed great numbers of stock during the summer seasons for ten years past.

It was an agitated question of range management at the time of the creation of the reserve, for evidence of overgrazing indicated that some move must be made or the range would be made a desert. The establishment of the reserve and its management seems to have settled the question, and it has been the aim of the Forest Service to so conduct the reserve as to give the greatest benefit to the greatest number of people, commensurate with the productive power of the reserve.

The regulation has reduced the number of sheep heretofore grazed by certain parties so as to not exceed one herd to each person.

The timber valuable for lumber purposes as found within the reserve is situated at an elevation varying from 7,000 to 9,000 feet, and always upon the northern slopes, where it is protected from the fierce and heavy winds. Among the species found are: White Fir (*abies concolor*) local name Black Balsam; Balsam Fir (*abies lasiocarpa*) local name White Balsam; Engelmann Spruce, Douglas Spruce, Blue Spruce and Western Yellow Pine, and Lodgepole Pine.

During the past and before the establishment of the reserve much timber has been destroyed by fire and wasteful cutting, especially was this true during the years of 1890 and 1891 when the forests were cut without reservation and in an extremely wasteful manner for the purpose of making railway ties.

Several places within the reserve virgin pine forests are to be found, and in many places dense undergrowth of shrubs.

The timber operations have taken on a new aspect since the cuttings are done under the immediate supervision of an officer of the Forest Service, and at one cutting point upon the reserve last season where only 200,000 feet were cut, more than 700 cords of dead, down and valueless material was piled and burned.

# TIMBER STUMPAGE BUSINESS OF THE NATIONAL GOVERNMENT

## Over a Quarter of a Million Dollars' Worth Sold in 1905—Saving the Woods While Selling the Trees—Prompt, Businesslike Management.

A NATURAL feeling among lumbermen toward the forest work of the Government is that the Government is not in the lumber business and can not, therefore, take the lumberman's business point of view. Yet a greater misconception could scarcely exist. As a dealer in stumpage the Government is the largest lumber dealer in the country. Further, it applies to its sales the practice of scientific forestry, requiring the removal of the timber under the same sort of instructions which it advises for private operators. Thus the Forest Service, in its reserve work, is giving an object lesson on a huge scale to enforce its teachings that conservative manage-

ment and profit may go hand in hand. In the year 1905 the total sales reached a value of $273,659.82.

By the Act of March 3, 1891, the President of the United States was authorized to proclaim forest reserves; a power first exercised by President Harrison, who, on March 30 of that year, created the Yellowstone Park Timber Land Reserve. Authority over these reserves was given to the Secretary of the Interior, the administrative work to be conducted by the General Land Office.

The mere creation of forest reserves, however, without provision, for their administration was both ineffectual and annoying to local interests dependent upon their resources. Consequently the Secretary of the Interior, in 1896, requested the National Academy of Sciences to recommend a National forest policy. This resulted in the passage of the Act of June 4, 1897, under which, with several subsequent amendments, forest reserves are now administered.

### CHANGE OF ADMINISTRATION.

Still, the result was not satisfactory. Scientific knowledge and a technically trained force were necessary. The Bureau of Forestry had frequently to be consulted. Finally, the Act of February 1, 1905, was passed, transferring the entire jurisdiction, except in matters of surveys and passing of title, to the Secretary of Agriculture. The actual work of administration was thereupon given to the Bureau of Forestry, since July 1, 1905, styled the Forest Service.

The policy upon which these reserves were to be administered is indicated by the following extracts from the letter written February 1, 1905, by the Secretary of Agriculture to the Forester:

"In the administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people, and not for the temporary benefit of individuals or companies. All the resources of forest reserves are for *use*, and this must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources. * * *

"You will see to it that the water, wood, and forage of the reserves are conserved and wisely used for the benefit of the home builder first of all. * * * In the management of each reserve local questions will be decided upon local grounds; * * * where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good to the greatest number in the long run."

The principal object of the forest reserves is use. The policy governing these great storehouses of natural wealth is not one of locking up and rendering inaccessible their resources, but of conserving and multiplying them and making them available to consumers.

### EFFECTIVE ORGANIZATION.

That a Government bureau can actually thus subserve the interests of users is at first a matter of some skepticism with practical lumbermen. Their fear is that such work will be conducted from a remote Government office by men unfamiliar with local needs.

It has remained for the Forest Service practically to demonstrate the groundlessness of these fears. To this end it has rapidly developed an organization. On July 1, 1898, the Division of Forestry employed eleven persons, of whom six filled clerical or other subordinate positions, and five belonged to the scientific staff. Of the latter, two were professional foresters. The Division possessed no field equipment; practically all of its work was office work. At the opening of the present fiscal year the employees of the Forest Service numbered 821, of whom 153 were professional, trained foresters. The field force of the Forest Service contains the grades of Forest Inspector, Forest Supervisor, For-

est Assistant, and Forest Ranger. In so far as possible the administration of the reserves takes place on the ground and with the promptness that is supposed to characterize private business.

One of the most important aspects of forest administration is the sale of timber. All timber on forest reserves which can be cut safely and for which there is actual need is for sale. Applications to purchase are invited. Green timber may be sold except where its removal makes a second crop doubtful, reduces the timber supply below the point of safety, or injures the streams. All dead timber is for sale. The cutting of this timber is done under the local supervision of the Forest Service and in accordance with certain clearly defined and practical rules.

SPECULATION PREVENTED.

The restrictions governing the timber sales, while effective, are simple. Application is made to the local officer in charge of the reserve from which the timber is desired, who executes small sales on the ground. In case of large sales, the application is forwarded to the Forest Service, from which the advertisement of the sale is made. Applicants for timber are required to send sealed bids to the Forest Service. Small bidders enjoy exactly equal opportunities with large, and monopolization is effectually forestalled. The highest bid fixes the price. Should the first applicant desire to begin cutting immediately he may (except in California) do so, on condition that he pay in advance at a price already fixed by the Forest Service, and that he obligate himself to pay the full amount named in the highest bid. Thus delay is avoided and the Government is protected. Speculation in reserve timber is made impossible by the provision that the timber must be removed within a specified time( and that when a contract extends over several years a proportionate amount of timber must be removed each year. Five years is the extreme limit of a sales contract.

That these restrictions are not onerous is shown by the numerous sales made under them. A single sales of 50,000,000 feet of lodgepole pine for railroad ties is pending on the Montana Division of the Yellowstone Forest Reserve. It is estimated that 165,000,000 feet B. M. of lodegpole pine can be taken from one watershed in the Medicine Bow Forest Reserve, still leaving a large percentage for future crops. Much timber is sold in small lots; fifty applications for such sales are made to each single application for 1,000,000 board feet or more; the prompt, businesslike consideration accorded such applications standing in marked contrast with the slow methods once prevailing, when all applications had to be made through Washington.

FORESTS AS REVENUE.

During the year 1905 the sales of timber from the National reserves were as follows:

The largest sales so far made are 71,466,537 board feet from South Dakota; 68,255,916 from Wyoming; and 5,327,443 from Utah.

In sales of wood for fuel South Dakota led with 29,844½ cords; Arizona followed with 16,649; and Colorado with 10,795½. The total number of cords sold was 74,120.

In sales of posts and poles Montana led with 119,500, followed by Wyoming with 30,750, and Colorado with 13,988. The total number sold was 188,740.

The largest timber sales were made in Wyoming, where they reached $143,894.81. South Dakota's sales ranked second in value, amounting to $78,958.24, and Colorado's to $23,937.07. The total sales for 1905 reached $273,659.82.

Nor are the receipts from these sales swallowed up by the cost of administration. The entire property of the forest reserves, worth $250,000,00 in cash, is now being administered at a cost of less than one-third of 1 per cent. on its value, while increase in

that value of not less than 10 per cent. a year is taking place. As the use of the reserves increases, the cost of administration must, of course, increase also, but receipts will certainly increase much more rapidly. The time is not far distant when the forest reserves will become self-sustaining. Later, they may confidently be expected to become a source of public revenue.

# BEECH (Fagus atropunicea)*

## VII.—Notes on Forest Trees Suitable for Planting in the United States.

### DISTRIBUTION.

The natural range of the beech is from Nova Scotia to northern Wisconsin; south to western Florida, and west to southeastern Missouri and Texas. It reaches its maximum development on the slopes of the Allegheny Mountains and in the valley of the lower Ohio River. It occurs in mixture with most of the trees included in its range.

The range for economic planting corresponds closely with its natural range.

### SOIL.

The beech prefers fresh, cool, and rich soil. In the North it is found upon the slopes of mountains, where it sometimes forms pure stands; in the South it grows along the margins of swamps, or in bottomlands along streams. It grows well on limy or chalky soils.

### GROWTH AND REPRODUCTION.

The beech is a moderately rapid-growing tree, sometimes, under favorable conditions, reaching the height of 120 feet. In dense forests it produces a tall, straight, slender trunk, which is adapted for economic purposes. The tree is shade-enduring, and the lower limbs persist for a long time. The open-grown tree forms a short, conical trunk, with many small limbs branching from it. The lower ones droop towards the ground, and if not pruned the tree forms an elongated dome which is very ornamental for parks or lawns. The light-colored bark and fine spray of delicate branches make it even more beautiful in winter than when in full leaf.

The beech usually forms the understory in the mixed stands where it occurs. It reproduces well in shade from the seed, as well as from root suckers. The several nursery varieties are propagated by grafting.

The beech is adapted for planting under evergreens such as white, red, or pitch pines, or it may be planted in company with the yellow poplar, black walnut, ashes, or oaks. When planted with less tolerant trees, the beech acts beneficially by shading the ground, and at the same time aiding natural pruning and increasing the height growth of associated species. Beech is also adapted for planting on cut-over lands where reforestation is desirable.

If planted in pure stands, 8 feet by 8 feet is a good distance to set the seedlings. This requires 680 seedlings per acre.

If planted in mixtures, the following diagram illustrates a good plan;

[6 feet by 6 feet.]

P B P B
B B B B
P B P B
B B B B

*Furnished by U. S. Forest Service.

P—White, red, or pitch pine, yellow poplar, ashes, or oaks.

B—Beech.

This plan requires 908 beeches and 302 of the other species, or a total of 1,210 trees, to the acre.

Beech trees produce an abundant crop of nuts every two or three years. The three-cornered nuts ripen in the fall and drop soon after the first severe frost. If allowed to dry out, the nuts become rancid and the germs die. To prepare them for planting they should be stratified through the winter. A pit is dug and lined with mouse-proof material, or a large box is placed in it. Alternate layers of moist sand and nuts are then laid in and covered on top with a wire screen or boards. A mulch of leaves or straw mixed with some earth is thrown over the filled pit. Before the nuts are placed in the pit they should be fumigated with carbon bisulphide to kill the worms that may infest them. This may be done by placing them in a box, boring a hole through the cover, and pouring in some liquid carbon bisulphide. The hole should then be immediately plugged and left closed for two or three days. This will completely kill all insects without injuring the seed.

In the spring, as soon as the frost is out of the ground, the nuts should be planted, either directly in the permanent site, in which case three or four should be planted in each hole, or in a seedbed, from which the seedlings should be transplanted when a year old. In a seedbed the nuts, of which about 80 per cent should germinate, should be sown about 2 inches apart in rows. If they have not dried out during the winter, they should sprout in a few days. Care should be taken to keep weeds out by giving frequent cultivation. After a seed year young seedlings appear in large numbers in beech woods and may be dug up and transplanted, or they may be obtained at a reasonable price from nurserymen.

ECONOMIC USES.

Beech wood is hard, heavy, strong, and stiff. It is not durable in contact with the soil. It is fine grained and seasons with very little checking. It is used considerably in the manufacture of carpenters' tools and machinery. On account of its great hardness and stiffness it is admirably adapted for flooring in machine shops where rigidity is demanded, for, although strong, it will break before it bends much. For ordinary flooring it is so hard that it soon becomes very slippery and is, therefore, objectionable. It takes a beautiful polish and should be used in cabinetwork. It makes an excellent fuel.

ENEMIES.

The beech is one of our healthiest trees, being comparatively free from severe injury by insects or fungi, although many species of the latter occur upon it. A few common insects that prey upon it are the fall webworm and forest tent caterpillar, as well as other caterpillars which do considerable damage to the foliage. Plant-lice and scale insects are sometimes abundant, especially upon cultivated beech.

Whenever insects of any kind occur in destructive numbers, specimens should be referred to the Bureau of Entomology of the Department of Agriculture for determination and advice regarding means of control.

Information concerning the numerous fungi and methods for combating their attacks can be obtained by application to the Bureau of Plant Industry of the Department of Agriculture. Letters of inquiry should always be accompanied by specimens. Beech drops are low annual plants parisitic upon the roots of beech trees.

Owing to the thinness of its bark, the beech is very susceptible to injuries from fire, and plantations should be well protected by fire lines.

# REMARKABLE SALE OF RESERVE TIMBER

## A Million and A-half Ties to be Cut, a Large Percentage from Material Once Without a Market, but Now Made Servicable by Preservation

FROM several aspects a striking interest attaches to the recent sale by the government of about 50,000,000 feet of timber on the Montana division of the Yellowstone Forest Reserve to a contracting company which will convert most of the timber into railroad ties.

This is one of the largest sales ever made of government timber; the price is advantageous, and a large percentage of the cut will be of a species which a few years ago was without market value, namely, lodgepole pine. Further, it may be said with assurance that had not the preservative treatment of ties been shown to be both practical and economical, such a sale could not now have been made, for 60 per cent of the cut, or approximately 1,000,000 ties, is to be treated with preservatives by a process which experiment and trial have placed on a sound business basis.

The purchasers of the timber have contracted to supply the Chicago, Burlington and Quincy and the Northern Pacific railway companies with ties for a period covering three years. The timber for which they applied to the government consists of lodgepole pine, red fir, and spruce. A large proportion of the stand is lodgepole pine, which grows very densely. Consequently after all the specified timber has been removed, a plentiful stand of young trees will be left, which in a few years will again form a forest of merchantable dimensions.

The government will receive a stumping price of $2.50 per thousand feet for the red fir and $2.00 per thousand feet for the spruce and pine.

The story of the entrance of lodgepole pine into the timber market is an interesting chapter in the history of the use of forest products. Five years ago this tree was classed among the nearly worthless, inferior timbers growing in the northwestern states. It had never come into extensive use. Its liability to attack by fungus and to check in drying, its softness and lightness, and the large percentage of sapwood in its structure were disadvantages which seemed to handicap it permanently. Yet the possibility and the need of finding substitutes for scarcer woods had already led to the closer study of a number of unexploited species, and devices were being sought by which artificial treatment might be made to take the place of natural adaptability to a specific service.

Among these devices were improvements in seasoning methods and the use of preservatives. It was found that preservative treatment, which greatly prolonged the life of certain timbers, depends largely for its success upon the penetrability of the wood, which permits the preservative to enter the wood substance easily. The loblolly pine was seen to be exceedingly well adapted for preservative treatment, and also lodgepole pine, whose softness is combined with a high degree of permeability. In 1902 the seasoning and preserving of lodgepole pine was thoroughly taken up by the Forest Service, in co-operation with the Chicago, Burlington and Quincy Railroad and with the present purchasers of reserve timber in Montana. The results established its serviceability and thus opened a new field for the supply of ties, upon which the railroads are drawing so heavily.


**Laws Relating to Public Lands in the Philippine Islands.** Pp. 110, with line cuts. Published by Bureau of Insular Affairs, U. S. War Department, 1905. Washington, D. C.

The pamphlet here presented includes a complete synopsis of all the land laws of the Philippine Islands, methods of laying out claims, homesteads, etc., together with a resumé of all forest legislation . In that latter subject there is presented some valuable information regarding the native trees of the islands, their values, etc., together with various recognized rules for determining content, etc.

**Primer Containing Questions and Answers on the Public Land Laws in the Philippine Islands. 1906.**

**Pamphlet Containing the Mining Laws of the Philippine Islands. 1906.**

**Free Patent Circular. 1906.**

**Sales Circular. 1905.**

**Circular Relative to Leasing of Agricultural Public Lands in the Philippine Islands. 1906.**

In line with the pamphlet reviewed just above are the five publications here presented. Each pamphlet is issued separately in English and Spanish, and they are all designed to place before the people of the islands, and those interested there, authoritative information regarding the workings of certain portions of the land laws of the Philippines.

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**Yearbook, U. S. Department ot Agriculture, 1905.** P. 440. Illustrated. Government Printing Office, Washington, 1906.

By reason of a new ruling, the Yearbook of the Department of Agriculture has been divided into two separate bound parts, the first including the formal report of the Secretary of Agriculture to the President, and the reports of the various division chiefs to the Secretary, while in Part II. is included the papers and discussions of various agricultural subjects which have made previous editions of the volume so popular throughout the country. The Yearbook for 1905 contains a very laarge number of articles, all of which are of interest, and should prove exceedingly helpful.

There are a number of valuable contributions on forest subjects, including "How To Grow Young Trees for Forest Planting," by E. A. Sterling; "Insect Enemies of Forest Reproduction," A. D. Hopkins; "Waste in Logging Southern Yellow Pine," J. Girvin Peters; "Prolonging the Life of Telephone Poles," Henry Grinnell; and an exceedingly clear and comprehensive article on the "Progress of Forestry in 1905," by Quincy R. Craft. The latter contains a very valuable resume of the forest legislation throughout the United States during the fiscal year of 1905.

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**Forty-Eighth Annual Report of the Missouri State Horticultural Society.** pp. 451. Illustrated. Jefferson City, Mo., 1906.

The Forty-Eighth Annual Report of the Missouri Horticultural Society contains the proceedings in full of two of the most successful meetings in the history of the organization, those held at Versailles, June 13, 14, and 15, and at Kansas City, December 28, 29, 30, 1905. The volume contains a large amount of interesting and valuable information on horticultural subjects.

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**Forestry, A Profession for Young Men.** By Samuel J. Record. Published by the Botanical Department of Wabash University, 1906.

In this little pamphlet Mr. Record defines the scope of the profession of forestry, indicates what studies will be of most value to the student preparing to enter that profession, states what advantages and disadvantages it offers, and includes a lot of good common sense advice relating to the subject, given in the guise of simple information.

DEPARTMENT OF THE INTERIOR, Washington, D. C., May 8, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Billings, Montana, until 2 o'clock p. m., June 20, 1906, for the construction of about 17 miles of canal, involving approximately 350,000 cubic yards of excavation. Plans, specifications, and proposal blanks may be obtained from the Chief Engineer, Reclamation Service, Washington, D. C., or from the Engineer, Huntley, Montana. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., April 26, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Ore., until 3 o'clock p. m., June 28, 1906, for building the Cold Springs Dam, near Hermiston, Ore., including about 694,000 cubic yards of earth and gravel excavation, about 3,100 cubic yards of rock excavation, about 3,110 cubic yards of concrete, and about 35,000 cubic yards of rip rap and rock fill. Particulars may be obtained at the office of the U. S. Reclamation Service, at Washington, D. C., Portland, Ore., and Hermiston, Ore. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 12, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Klamath Falls, Ore., until 2 o'clock, p. m., June 21, 1906, for the construction of 19 miles of canal, and 27 miles of laterals in Klamath County, Ore., with checks, turnouts, culverts, bridges and other appurtenances involving about 570,000 cubic yards of excavation, 1,550 cubic yards of concrete masonry, and about 35,000 feet B. M. of lumber. Plans, specifications and forms of proposal may be obtained by application to the Chief Engineer of the United States Reclamation Service, Washington, D. C., the Supervising Engineer, 1108 Union Trust Building, Los Angeles, Cal., or the Project Engineer, Klamath Falls, Ore. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 3, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Ore., until 2 o'clock p. m., June 29, 1906, for the construction of about 25 miles of canal extending from the Umatilla River, near Echo, Ore., to the proposed Cold Springs Reservoir, consisting of the following work: About 700,000 cubic yards of earth excavation, about 6,000 cubic yards of rock excavation, about 2,300 cubic yards of concrete, and about 3,600 cubic yards of riprap, divided into two schedules. Particulars may be obtained at the offices of the United States Reclamation Service, Washington, D. C., and Portland, Ore. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., June 15, 1906. Sealed proposals will be received at the office of the Engineer, United States Reclamation Service, Billings, Mont., until 2 o'clock p. m., July 24, 1906, for furnishing about 405,000 pounds of steel bars for reinforcement of concrete. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, U. S. Geological Survey, Washington, D. C., or to the Engineer, Cody, Wyo. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., June 11, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Salt Lake City, Utah, until 3 o'clock p. m., August 30, 1906, for the construction of the Strawberry Tunnel, involving 18,600 linear feet, more or less, of tunnel, the same being a portion of a system for the diversion of about 500 cubic feet of water per second from Strawberry River to the Spanish Fork Valley, Utah. Particulars may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C., or the Engineer, Salt Lake City, Utah. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., June 7, 1906. Sealed proposals will be received at the office of the Reclamation Service, 876 Federal Building, Chicago, Ill., until 2 o'clock p. m., July 6, 1906, and thereafter opened, for the construction of deep and shallow wells, suction pipes, pumping stations, siphons, concrete lined conduits, and fencing. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., or to the Engineer, Garden City, Kans. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 29, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Billings, Mont., until 2 o'clock p. m., July 10, 1906, for the construction of the Corbett Dam, a reinforced concrete structure, located on the Shoshone River about 8 miles northeast of Cody, Wyo. The structure will require about 10,000 cubic yards of excavation, 5,000 cubic yards of concrete, 9,000 cubic yards of earth and gravel embankment and the placing of 250,000 pounds of steel reinforcement. Particulars may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C., or from the Project Engineer, Cody, Wyo. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., May 29, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Browning, Mont., until 2 o'clock p. m., July 31, 1906, for the construction of about 14 miles of canal for the diversion of 850 cubic feet of water per second from the St. Mary River at a point about 35 miles northwest of Browning, involving the excavation of about 1,700,000 cubic yards of material. Particulars may be obtained at the office of the Chief Engineer of the Reclamation Service, Washington, D. C., or from Cyrus C. Babb, Engineer, Browning, Mont. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., June 15, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Billings, Mont., until 2 o'clock p. m., August 7, 1906, for constructing a pumping plant, involving about 15,000 cubic yards of earth excavation, 600 cubic yards of concrete, building about 2,000 feet of reinforced concrete pipe, furnishing 120,000 pounds of steel, and furnishing and installing a water-power pumping plant, consisting of two vertical-shaft pumping units and accessories, each unit having a capacity of 28 cubic feet of water per second, lifted fifty feet. The plant will be located near Ballantine Station on the Chicago, Burlington and Quincy Railway, 23 miles east of Billings, Mont. Particulars may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C., or the Engineer, Huntley, Mont. E. A. HITCHCOCK, Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., June 4, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Williston, N. D., until 10 o'clock a. m., July 9, 1906, for the installation of steam and electric pumping plants, and electric generating and transmission apparatus, including three pumping stations containing centrifugal pumps of 20 and 30 cubic feet per second capacity under heads of from 30 to 50 feet, driven by steam engines and electric motors aggregating 1,200 horsepower; also two 300 K. W. steam turbine generating units, a 1,000 horsepower boiler plant and accessories, the necessary buildings and 3-mile transmission line, located in the vicinity of Williston, N. D. Particulars may be obtained from the Chief Engineer, U. S. Reclamation Service, Washington, D. C., or from H. A. Storrs, Electrical Engineer, Williston, N. D. E. A. HITCHCOCK, Secretary.

# THE National Irrigation Association


**Chicago,** 1405 Fisher Building

**New York,** 17 Battery Place

**Washington,** Star Building


## OFFICERS



**The objects of the Association, as set forth in its Constitution, are as follows:**

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Convention, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the enconragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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